VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana State, India.

www.vardhaman.org

BACHELOR OF TECHNOLOGY

MECHANICAL ENGINEERING

(Accredited by NBA)

ACADEMIC REGULATIONS
COURSE STRUCTURE (VCE-R14)

CHOICE BASED CREDIT SYSTEM

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2014 - 2015)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2015 - 2016)

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana, India.

www.vardhaman.org

PRELIMINARY DEFINITIONS AND NOMENCLATURES

- "Autonomous Institution / College" means an institution / college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.

- "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.

- "Commission" means University Grants Commission.

- "AICTE" means All India Council for Technical Education.

- "University" means Jawaharlal Nehru Technological University Hyderabad.

- "College" means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.

- "Program" means:
  - Bachelor of Technology (B. Tech.) Degree program
  - UG Degree Program: B. Tech.

- "Branch" means specialization in a program like B. Tech. Degree program in Civil Engineering,B. Tech. Degree program in Computer Science and Engineering etc.

- "Course" or "Subject" means a theory or practical subject, identified by its course-number and course-title, which is normally studied in a semester. For example, A2001: Linear Algebra and Ordinary Differential Equations, A2501: Programming for Problem Solving, etc. The description of allocation of course code is mentioned in the table 1.

Table 1: Course Code Description

First Digit	Second Digit	Third Digit	Fourth and Fifth Digits
Indicates Program	**Indicates Regulation**	**Indicates Department**	**Indicates Course Number**
A : B. Tech. **B** : M. Tech. **C** : MBA	**1** : R11 **2** : R14	**0**: H&S/MBA **1** : Civil **2** : EEE **3** : MECH **4** : ECE **5**: CSE **6** : IT	**01** **02** **..** **..**

- T – Tutorial, P – Practical, D – Drawing, L - Theory, C - Credits

FOREWORD

The autonomy conferred on Vardhaman College of Engineering by UGC based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the norms set by the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards Degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

Vardhaman College of Engineering is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Board of Studies are constituted under the guidance of the Governing Body of the College and recommendations of the JNTUH to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after a prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college in order to produce quality engineering graduates for the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought, at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana State, India.

www.vardhaman.org

INSTITUTE VISION, MISSION & QUALITY POLICY

Vision:

To aim at inculcating the spirit of high ambitions, healthy attitudes, discipline and multidimensional excellence in the students and strive to mould them to scale new heights and get their mental horizons enlarged through value-based technical education and congenial study environment.

Mission:

To sharpen the inherent professional skills of our students to enable them compete in the complex world through our newly evolved quality management system and dedicated staff. The practical oriented education and the research tie-up with industries we provide, tend to promote the intellectual pursuits of the students.

Quality Policy:

Vardhaman College of Engineering strives to establish a system of quality assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

www.vardhaman.org

DEPARTMENT OF MECHANICAL ENGINEERING

Department Vision:

The department of mechanical engineering will be a premier centre of Engineering education and research which strives to be a source of qualitative, entrepreneurial and innovative mechanical engineers.

Department Mission:

The mission of the department is to provide high quality technical education through innovative curriculum and effective teaching. Strive to promote research in cutting edge technologies with a sprit to serve the society with professional ethics.

Program Educational Objectives (PEOs)

PEO - I
To prepare graduates who will make their way to the society with proper scientific and technical knowledge.

PEO – II
To enable the students with strong fundamentals and method of synthesis to work in design and analysis of mechanical systems.

PEO – III
To create the flexible atmosphere that promotes creativity and innovation among students and faculty, encourage professional ethics and lifelong learning.

PEO - IV
To equip students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve, and analyze problems and to prepare them for further studies.

Program Outcomes (POs):

PO1: **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems**.**

PO2: **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences**.**

PO3: **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for the public health and safety, and cultural, societal, and environmental considerations**.**

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions**.**

PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice**.**

PO7: **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development**.**

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice**.**

PO9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings**.**

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions**.**

PO11: **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments**.**

PO12: **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Demonstrate knowledge in the area of design, analysis and fabrication of mechanical systems.

PSO2: Apply learned concepts and management skills to associate professionally in industry or as an entrepreneur.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana, India.

www.vardhaman.org

ACADEMIC REGULATIONS

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2014 - 2015)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2015 - 2016)

For pursuing undergraduate Bachelor Degree Program of study in Engineering (B. Tech.) offered by Vardhaman College of Engineering under Choice Based Credit System (CBCS)and herein after Vardhaman College of Engineering is referred to as VCE.

1. APPLICABILITY

All the rules specified herein, approved by the Academic Council, will be in force and applicable to students admitted from the academic year 2014-2015 onwards. Any reference to "College" in these rules and regulations stands for Vardhaman College of Engineering.

2. EXTENT

All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman of Academic Council is final. As per the requirements of statutory bodies, Principal, Vardhaman College of Engineering shall be the Chairman of the Academic Council.

3. ADMISSION

3.1. Admission into First year of Four Year B. Tech. Degree Program of study in Engineering:

3.1.1. Eligibility:

A candidate seeking admission into the first year of four-year B. Tech. Degree Program should have

(i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per theguidelines of APSCHE.

(ii) Secured a rank in the EAMCET examination conducted by A.P. State Council forHigher Education for allotment of a seat by the Convener, EAMCET, for admission.

3.1.2. Admission Procedure:

Admissions are made into the first year of four-year B.Tech. Degree programme as per the stipulations of A.P State Council of Higher Education (APSCHE), Government of Telangana.

(a) Category A seats are filled by the Convener, EAMCET.

(b) Category B seats are filled by the Management.

3.2. Admission into the Second year of Four Year B. Tech. Degree Program in Engineering

3.2.1. Eligibility:

A student seeking admission under lateral entry into the II year I semester B. Tech. Degree Program should have passed the qualifying exam (B.Sc. Mathematics & Diploma holders), based on the rank secured by the student at Engineering Common Entrance Test (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana.

3.2.2. Admission Procedure:
Admissions are made into the II year of four-year B. Tech degree Program through Convener, ECET (FDH) 20% against the sanctioned strength in each Program of study under lateral entry scheme.

4. PROGRAMS OFFERED

Vardhaman College of Engineering, an autonomous college affiliated to JNTUH, offers the following B. Tech Programs of study leading to the award of B. Tech. Degree under the autonomous status.

1) B. Tech. - Civil Engineering
2) B. Tech. - Electrical and Electronics Engineering
3) B. Tech. - Mechanical Engineering
4) B. Tech. - Electronics and Communication Engineering
5) B. Tech. - Computer Science and Engineering
6) B. Tech. - Information Technology

5. MEDIUM OF INSTRUCTION

The medium of instruction and examinations for all courses is English.

6. DURATION OF THE PROGRAMS

6.1. Minimum Duration

6.1.1. B. Tech. Degree program duration is for a period of minimum four academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

6.1.2. For students admitted under lateral entry scheme, B. Tech. Degree program duration is for a period of minimum three academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad (JNTUH).

6.2. Maximum Duration

6.2.1. The maximum period within which a student must complete a full-time academic program is 8 years for B.Tech. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

6.1.1. For students admitted under lateral entry scheme in B.Tech degree program, the maximum period within which a student must complete a full-time academic program is 6 years. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

6.1.2. The period is calculated from the academic year in which the student is admitted for the first time into the B. Tech. Degree Program.

7. SEMESTER STRUCTURE

The College shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term follows in sequence. Each semester shall be of 23 weeks duration and this period includes time for course work, examination preparation, and conduct of examinations. Each semester shall have a minimum of 85 working days for conducting classes. The academic calendar is shown in Table 1 is declared at the start of the semester.

The first and second semesters shall have the duration to accommodate a minimum of 16 instructional weeks per semester.

Table 2: Academic Calendar

FIRST SEMESTER (23 weeks)	Instruction Period	:17 weeks	19 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Semester Break			2 weeks
SECOND SEMESTER (23 weeks)	Instruction Period	:17 weeks	19 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Summer Vacation			4 weeks

8. PROGRAM STRUCTURE

Every programme of study shall be designed to have 42 - 45 theory courses and 14 - 16 laboratory courses.

The Program of instruction consists of:

(i) A general core programme comprising Basic Sciences, Mathematics, Basic Engineering, Humanities, Social Sciences and Management.
(ii) An Engineering Core programme imparting to the student the fundamentals of engineering in the branch concerned.
(iii) An elective programme enabling the students to take up a group of departmental and interdepartmental courses of interest to him / her.

In addition, a student has to carry out a mini project, project work, technical seminar and comprehensive viva.

Every course of the B. Tech. Program will be placed in one of the ten groups of courses with credits as listed in the Table 3.

Note: All components prescribed in the curriculum of any program of study shall be conducted andevaluated.

Contact Periods: Depending on the complexity and volume of the course the number of contact periods per week will be assigned.

Table 3: Group of courses

S. NO	GROUP OF COURSES	CATEGORY	RANGE OF TOTAL CREDITS
1	Humanities, Social Sciences and Management	HS	14
2	Basic Sciences	BS	26
3	Basic Engineering	BE	32
4	Core Engineering	CE	114
5	Professional Elective	PE	12
6	Inter Departmental Elective	IE	08
7	Mini Project	MP	02
8	Technical Seminar	TS	02
9	Comprehensive Viva	CV	02
10	Project Work	PW	08
		TOTAL	220

9. CREDIT BASED SYSTEM

All the academic programs under autonomy are based on credit system. Credits are assigned based on the following norms:

9.1. The duration of each semester will normally be 23 weeks with 6 days a week (the second Saturday will be observed as holiday in a month). A working day shall have 6 periods each of 60 minutes duration.

Each course is normally assigned a certain number of credits as follows:

- 1 credit per lecture / tutorial period per week.
- Credits for three (or more) period hours of practicals.
- Credits for mini project.
- Credits for technical seminar with 6 periods per week.
- Credits for comprehensive viva examination.
- 8 credits for project work with 12 periods per week.

9.2. The four-year curriculum of any B. Tech. program of study shall have 220 credits in total. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

In the case of lateral entry students, B. Tech. program for III, IV, V, VI VII and VIII semesters of study shall have a total 168 credits.

9.3. For courses like mini project / project work / technical seminar / comprehensive viva, where formal contact hours are not specified, credits are assigned based on the complexity of the workto be carried out.

10. METHOD OF EVALUATION

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks each for theory and 75 marks for practical / computer aided engineering drawing lab. In addition, mini-project, technical seminar, comprehensive viva and project work shall be evaluated for 50, 50, 50 and 200 marks respectively.

10.1 THEORY COURSES

The evaluation of the students in each course is a continuous process and is based on their performance in different examinations and attendance as mentioned below:

Table 4: Method of Evaluation

Mid Semester Test	20 Marks
Online Objective Test	05 Marks
End Semester Examination	75 Marks

10.1.1. MID SEMESTER TEST

There will be two Mid Semester Tests in theory courses for a maximum of 20 marks to be answered in two hours duration. The first Mid Semester Test will be held in the 09th week with the announced schedule in the first two units of syllabus. The second Mid Semester Test will be held in the 18th week with the announced schedule in the last three units of syllabus. In case a student does not appear in the Mid Semester Test due to any reason whatsoever, will get zero marks(s).

10.1.2. ONLINE OBJECTIVE TEST

There will be one Online Objective Test in Theory Courses for a maximum of 05 marks to be answered in half an hour duration. The Online Objective Test will be held in the 18^{th} week with the announced schedule in all the units of syllabus. In case a student does not appear in the Online Objective Test due to any reason whatsoever, will get zero marks(s).

10.1.3. END SEMESTER EXAMINATION

The end semester examination question paper in theory courses will be for a maximum of 75

marks to be answered in three hours duration. There shall be two questions of descriptive type from each unit with internal choice. Each question carries 15 marks. Each theory course shall consist of five units of syllabus.

The question paper shall be set externally and valued both internally and externally. If the difference between the first and second valuations is less than or equal to 15% of the maximum of the paper the better of the two valuations shall be awarded and if the difference between the first and second valuation is more than 15%, the chief examiner appointed has to discuss with the two valuers and have his own assessment of the script. The marks given by the chief examiner shall be final for award.

10.2 PRACTICAL

Practicals shall be evaluated for 75 marks, out of which 50 marks are for external examination and 25 marks are for internal evaluation. The 25 internal marks are distributed as 15 marks for day-today work/attendance and 10 marks for internal examination. The external end - examination shall be conducted by the teacher concerned and an external examiner from outside the college.

12 out of 14 to 16 experiments / exercises recommended are to be completed in a semester.

10.3 For Engineering Drawing-I, Engineering Drawing-II and Machine Drawing, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work/attendance and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal evaluations in a semester and the average of the two internal evaluations is considered for the awarding internal marks.

10.4 The Computer Aided Engineering Drawing Lab, Computer Aided Aircraft Engineering Drawing Lab wherever offered is to be treated as a practical subject. Evaluation method adopted for practical subjects shall be followed here as well.

10.5 MINI PROJECT

The mini project in an industry shall be carried out during the summer break for a minimum of 4 weeks after the VI Semester and completed before the start of the VII semester. A report has to be submitted for assessment to an internal evaluation committee comprising Head of the Department or his / her nominee and two faculty of the department including the project supervisor for 50 marks. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits. The mini project and its report shall be evaluated in VII semester.

10.6 TECHNICAL SEMINAR

The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department. The two components of the seminar are distributed between two halves of the semester and are evaluated for 50 marks each. The average of the two components shall be taken as the final score. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

10.7 COMPREHENSIVE VIVA

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. This is aimed at assessing the student's understanding of various subjects studied during the entire program of 4 years. The comprehensive viva shall be evaluated for 50marks at the end of VIII semester. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

10.8 PROJECT WORK

The project work shall be evaluated for 200 marks out of which 50 marks for internal evaluation and 150 marks for end-semester evaluation. The project work shall be spread over in VII semester and in VIII semester. The project work shall be somewhat innovative in nature, exploring the research bent of mind of the student. A project batch shall comprise of not more than four students. At the end of VII

semester, students should submit synopsis summarizing the work done in VII semester. The project is expected to be completed by the end of VIII semester.

In VIII semester a mid-course review is conducted by Head of the Department and the project supervisor on the progress for 25 marks. On completion of the project a second evaluation is conducted for award of internal marks of another 25 marks before the report is submitted making the total internal marks 50. The end semester examination shall be based on the report submitted and a viva-voce exam for 150 marks by committee comprising of the Head of the Department, project supervisor and an external examiner. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

11. ATTENDANCE REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

11.1. A student shall be eligible to appear for end semester examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

11.2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

11.3. Shortage of attendance that is below 65% in aggregate shall in no case be condoned.

11.4. The shortage of attendance shall not be condoned more than four times during the entire course.

11.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

11.6. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

11.7. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

11.8. Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of Telangana norms in vogue.

12. MISSING EXAMINATION

A student who fails to attend a Mid Semester Test / Online Objective Test due to hospitalization or accident shall be permitted with prior approval of the HOD and the Principal to take up missing examination of the particular course, subject to payment of a prescribed fee for each missing examination. Students deputed for official programmes of the college are exempted from paying the fee for missing test. Such missing examinations should be completed outside the regular class hours within 7 working days of the respective examinations. Attendance will not be given for taking up missing examinations. The missing examinations are allowed only for Mid Semester Test / Online Objective Test and not for end semester final theory and practical examinations.

13. EVALUATION

Following procedure governs the evaluation.

13.1. Marks for components evaluated internally by the faculty should be submitted to the Controller of Examinations one week before the commencement of the semester-end examinations. The marks for the internal evaluation components will be added to the external evaluation marks secured in the semester-end examinations, to arrive at total marks for any subject in that semester.

13.2. Performance in all the courses is tabulated course-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, based on the recommendations of moderation committee and course-wise marks lists are finalized.

13.3. Student-wise tabulation is done and student-wise memorandum of marks is generated which is issued to the student.

14. PERSONAL VERIFICATION

Students shall be permitted for personal verification of the semester-end examination answer scripts within a stipulated period after payment of prescribed fee.

15. SUPPLEMENTARY EXAMINATION

Supplementary examinations for the odd semester shall be conducted with the regular examinations of even semester and vice versa, for those who appeared and failed or absent in regular examinations. Such students writing supplementary examinations may have to write more than one examination per day.

16. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR B. TECH. PROGRAM OF STUDY

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion / completion of regular B. Tech. Program of study.

FOR STUDENTS ADMITTED INTO B. TECH. (REGULAR) PROGRAMME

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject and project, if he secures not less than 35% of marks in the end semester examination and a minimum of 40% of marks in the sum of the internal evaluation and end semester examination taken together.

ii. In case of mini project, technical seminar and comprehensive viva a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he/she secures not less than 40% of marks.

iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he/she secures not less than 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from IV semester to V semester of programme of study only if he fulfils the academic requirement of securing 40 out of 80 credits from the regular examinations held up to the end of III semester including supplementary examinations held up to the end of IV semester.

v. A student shall be promoted from VI semester to VII semester of programme of study only if he fulfils the academic requirements of securing 68 out of 136 credits, from the regular examinations held up to the end of V semester including supplementary examinations held up to the end of VI semester.

vi. A student shall register for all the 220 credits and earn at least 212 credits. Marks obtained in all the 212 credits shall be considered for the award of the class based on aggregate of marks.

vii. A student who fails to earn 212 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

viii. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

FOR LATERAL ENTRY STUDENTS (BATCHES ADMITTED FROM 2015–2016)

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and semester-end examination taken together.

ii. In case of mini project, technical seminar and comprehensive viva a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he/she secures not less than 40% of marks.

iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he/she secures not less than 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from VI semester to VII semester only if he fulfils the academic requirements of securing 42 out of 84 credits from the regular examinations held up to the end of V semester including supplementary examinations held up to the end of VI semester.

v. A student shall register for all 168 credits and earn at least 160 credits. Marks obtained in all the 160 credits shall be considered for the award of the class based on aggregate of marks.

vi. A student who fails to earn 160 credits as indicated in the course structure within **six** academic years from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

vii. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

17. TRANSITORYREGULATIONS

Students who are detained for lack of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of eight years, and a lateral entry student within six years, for the award of the B. Tech. Degree.

18. TRANSFER OF STUDENTS FROM OTHER COLLEGES/UNIVERSITIES

Transfer of students from the Constituent Colleges of *JNTUH* or from other Colleges/Universities shall be considered only on a case-to-case basis by the Academic Council of the Institute.

19. TRANSCRIPTS

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued upto any point of study to a student on request, after payment of requisite fee.

20. AWARD OF DEGREE

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Hyderabad on the recommendations of the Chairman, Academic Council.

20.1. For students admitted into B.Tech. program (Batches admitted from 2014-2015)

Eligibility: A student shall be eligible for the award of B. Tech. Degree, if he fulfils all the following conditions:

- The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
- The candidate shall register for 220 credits and secure at least 212 credits with compulsory subjects as listed in the Table below.

Serial Number	Subject Particulars
1	All First Year Theory Subjects
2	All practical subjects
3	Industry oriented mini project
4	Comprehensive Viva-voce
5	Seminar
6	Project work

- Obtained not less than 40% of marks (minimum requirement for declaring as passed).
- Has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

20.2. For lateral entry students (batches admitted from 2015–2016)

Eligibility: A student shall be eligible for the award of B. Tech. Degree, if he fulfills all the following conditions:

- The candidate shall pursue a course of study for not less than three academic years and not more than six academic years.
- The candidate shall register for 168 credits and secure at least 160 credits with compulsory subjects as listed in the Table below.

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-voce
4	Seminar
5	Project work

- Obtained not less than 40% of marks (minimum requirement for declaring as passed).
- Has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

20.3. Award of class

After a student has satisfied the requirement prescribed for the completion of the Program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes shown in Table 5:

Table 5: Declaration of Class is based on percentage of marks to be secured

Class Awarded	Grades to be Secured	
First Class with Distinction	70% and above	From the aggregate marks secured from 212 Credits for Regular Students and 160 Credits for Lateral Entry Students.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	
Fail	Below 40%	

Sometimes, it is necessary to provide equivalence of percentages and/or *Class* awarded with *Grade Point Average (GPA).* This shall be done by prescribing certain specific thresholds in averages for *Distinction, First Class and Second Class,* as in Table 5.

Table 6: Percentage Equivalence of Grade Points (For a 10-Point Scale)

Grade Points (GP)	Percentage of Marks
4.75	≥ 40 and < 45
5.25	≥ 45 and < 50
5.75	≥ 50 and < 55
6.25	≥ 55 and < 60
6.75	≥ 60 and < 65
7.25	≥ 65 and < 70
7.75	≥ 70 and < 75
8.25	≥ 75 and < 80
8.75	≥ 80 and< 85

9.25	≥ 85 and < 90
9.75	≥ 90 and < 95
10	≥ 95

21. ADDITIONAL ACADEMIC REGULATIONS

i. Courses like projects / mini projects / seminars can be repeated only by re-registering for all the components in that semester.

ii. When a student is absent for any examination (internal or external) he is treated as to have obtained absent in that component (course) and aggregate of marks is done accordingly.

iii. When a component is cancelled as a penalty, he is awarded zero marks in that component.

22. REGISTRATION

22.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar IN PERSON. It is absolutely compulsory for the student to register for courses in time. IN ABSENTIA registration will not be permitted under any circumstance.

22.2. Registration without fine: The courses prescribed for a semester can be registered on the date scheduled in the academic calendar. The registration is also permitted on the second day (which is the first working day of the semester) without fine.

22.3. Registration with fine: Late registration shall be permitted by the HOD concerned up to seven working days inclusive of the date of registration on payment of a late registration fee of stipulated amount.

22.4. Procedure to get permission for late registration: The student concerned shall apply with proper reason to the HOD concerned through the Academic Counselor to get the permission of the Dean (UG) for the late registration of the courses. Beyond the prescribed time limit, no student shall be permitted to register the courses for a particular semester.

23. TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the college in the following circumstances:

I. If the student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

II. If the student fails to satisfy the norms of discipline specified by the Institute from time to time.

24. CURRICULUM

I. For each program being offered by the Institute, a Board of Studies (BOS) is constituted in accordance with AICTE/UGC/JNTUH statutes.

II. The BOS for a program is completely responsible for designing the curriculum at least once in two years for that program.

25. WITHHOLDING OF RESULTS

If the student has not paid any dues to the college/if any case of indiscipline/malpractice is pending against him/her, the results of the student will be withheld. The issue of the Degree is liable to be withheld in such cases.

26. GRIEVANCES AND REDRESSAL COMMITTEE

"Grievance and Redressal Committee" (General) constituted by the Principal shall deal in all grievances pertaining to the academic/administrative/disciplinary matters. The composition of the complaints cum Redressal committee shall be:

Headed by Senior Faculty member
Heads of all departments
A senior lady staff member from each department (if available)

The committee constituted shall submit a report to the principal of the college and the penalty to be imposed. The Principal upon receipt of the report from the committee shall, after giving an opportunity of being heard to the person complained against, submit the case with the committee's recommendation to the Governing Body of the college. The Governing Body shall confirm with or without modification the penalty recommended after duly following the prescribed procedure.

27. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the student who involves in malpractice/behaves in an in-disciplinary manner during the examination. The committee shall consist of:

Principal
Subject expert
Head of the department to which the student belongs to
The invigilator concerned
Controller of Examinations

The committee constituted shall conduct the meeting on the same day of examination or latest by next working day of the incident and punish the student as per the guidelines prescribed by the JNTUH from time to time.

Any action on the part of student at the examination like trying to get undue advantage in the performance at examinations, trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff who are in-charge of conducting examinations, evaluating examination papers and preparing/keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry.

28. AMENDMENTS TO REGULATIONS

The Academic Council of Vardhaman College of Engineering reserves the right to revise, amend, or change the regulations, scheme of examinations, and/or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

29. STUDENTS' FEEDBACK

It is necessary for the College to obtain feedback from students on their course work and various academic activities conducted. For this purpose, suitable feedback forms shall be devised by the College and the feedback is obtained from the students regularly in confidence by administering the feedback form in print or on-line in electronic form.

The feedback received from the students shall be discussed at various levels of decision making at the College and the changes/improvements, if any, suggested shall be given due consideration for implementation.

30. GRADUATION DAY

The College shall have its own annual *Graduation Day* for the distribution of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The College shall institute Prizes and Awards to meritorious students, for being given away annually at the *Graduation Day.* This will greatly encourage the students to strive for excellence in their academic work.

31. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

31.1. Merit Rank will be declared only for those students who have been directly admitted in VCE under Autonomous Regulations and complete the entire course in VCE only within the minimum possible prescribed time limit, i.e., 4 years for B.Tech, 3 years for B.Tech under lateral entry scheme.

31.2. A student shall be eligible for a merit rank at the time of award of degree in each branch of Bachelor of Technology, provided the student has passed all subjects prescribed for the particular degree program in first attempt only.

31.3. Academic performance will be the sole criteria for awarding the merit rank and will be based only on performance of the student from the first to the eighth semester of the course.

31.4. The number of Merit Ranks to be announced for any course / program / branch / specialisation will be as follows:

3 (Three) Merit Ranks if the AICTE sanctioned intake is less than or up to60.

4 (Four) Merit Ranks if the AICTE sanctioned intake is greater than60.

5 (Five) Merit Ranks if the AICTE sanctioned intake is greater than120.

31.5. Award of prizes, scholarships, or any other Honours shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.

32. CODE OF CONDUCT

32.1. Each student shall conduct himself / herself in a manner befitting his / her association with VCE.

32.2. He / she is expected not to indulge in any activity, which is likely to bring disrepute to the college.

32.3. He / she should show due respect and courtesy to the teachers, administrators, officers and employees of the college and maintain cordial relationships with fellow students.

32.4. Lack of courtesy and decorum unbecoming of a student (both inside and outside the college), wilful damage or removal of Institute's property or belongings of fellow students, disturbing others in their studies, adoption of unfair means during examinations, breach of rules and regulations of the Institute, noisy and unruly behaviour and similar other undesirable activities shall constitute violation of code of conduct for the student.

32.5. Ragging in any form is strictly prohibited and is considered a serious offence. It will lead to the expulsion of the offender from the college.

32.6. Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.

32.7. Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.

32.8. A student may be denied the award of degree / certificate even though he / she has satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.

32.9. Attendance is not given to the student during the suspension period

33. OTHER ISSUES

The quality and standard of engineering professionals are closely linked with the level of the technical education system. As it is now recognized that these features are essential to develop the intellectual skills and knowledge of these professionals for being able to contribute to the society through productive and satisfying careers as innovators, decision makers and/or leaders in the global economy of the 21st century, it becomes necessary that certain improvements are introduced at different stages of their education system. These include:

a. Selective admission of students to a Program, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.

b. Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and students' motivation are available.

c. Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.

d. Access to good library resources and Information & Communication Technology **(ICT)** facilities, to develop the student's mind effectively.

These requirements make it necessary for the College to introduce improvements like:

a. Teaching-learning process on modern lines, to provide Add-On Courses for audit/credit in a number of peripheral areas useful for students' self-development.

b. Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.

c. Generous use of ICT and other modern technologies in everyday activities.

34. GENERAL

Where the words "he", "him", "his", "himself" occur in the regulations, they include "she", "her", "herself".

Note: Failure to read and understand the regulations is not an excuse.

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the student is to be cancelled and sent to the University.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out,	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the

	or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

COURSE STRUCTURE (VCE-R14)

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R14

I SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2001	Mathematics - I	BS	3	1	-	4	25	75	100
A2002	Engineering Physics	BS	4	-	-	4	25	75	100
A2003	Engineering Chemistry	BS	4	-	-	4	25	75	100
A2501	Computer Programming	BE	3	1	-	4	25	75	100
A2301	Engineering Mechanics-I	BE	4	-	-	4	25	75	100
A2302	Engineering Drawing I	BE	-	2	3	2	25	75	100
A2008	Engineering Physics and Engineering Chemistry Lab	BS	-	-	3	2	25	50	75
A2502	Computer Programming Lab	BE	-	-	6	2	25	50	75
TOTAL			**18**	**04**	**12**	**26**	**200**	**550**	**750**

II SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2005	Technical English	HS	4	-	-	4	25	75	100
A2006	Mathematics-II	BS	3	1	-	4	25	75	100
A2007	Numerical Methods	BS	3	1	-	4	25	75	100
A2403	Basic Electronics	BE	3	1	-	4	25	75	100
A2303	Engineering Mechanics-II	BE	4	-	-	4	25	75	100
A2304	Engineering Drawing II	BE	-	2	3	2	25	75	100
A2009	English Language Communication Skills Lab	HS	-	-	3	2	25	50	75
A2305	Engineering Workshop Practice Lab	BE	-	-	3	2	25	50	75
TOTAL			**17**	**05**	**09**	**26**	**200**	**550**	**750**

III SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2307	Mechanics of Solids	CE	3	1	-	4	25	75	100
A2308	Mechanics of Fluids	CE	4	-	-	4	25	75	100
A2309	Thermodynamics	CE	3	1	-	4	25	75	100
A2310	Metallurgy & Material Science	CE	3	1	-	4	25	75	100
A2311	Machine Drawing	CE	-	-	6	4	25	75	100
A2011	Environmental Science	BS	4	-	-	4	25	75	100
A2312	MOS/MMS Lab	CE	-	-	3	2	25	50	75
A2313	Fuels and Lubrication lab	BE	-	-	3	2	25	50	75
TOTAL			21	03	06	28	200	**550**	**750**

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R14

IV SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2012	Managerial Economics and Financial Analysis	HS	4	-	-	4	25	75	100
A2314	Thermal Engineering-I	CE	3	1	-	4	25	75	100
A2315	Manufacturing Technology - I	CE	4	-	-	4	25	75	100
A2316	Hydraulic Machinery and Systems	CE	4	-	-	4	25	75	100
A2317	Kinematics of Machinery	CE	3	1	-	4	25	75	100
A2213	Electrical Technology	BE	4	-	-	4	25	75	100
A2318	Fluid Mechanics and Hydraulic Machinery Lab	CE	-	-	3	2	25	50	75
A2214	Electrical Technology Lab	BE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

V SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2319	Dynamics of Machinery	CE	3	1	-	4	25	75	100
A2320	Manufacturing Technology - II	CE	4	-	-	4	25	75	100
A2321	Thermal Engineering-II	CE	3	1	-	4	25	75	100
A2322	Design of Machine members-I	CE	3	1	-	4	25	75	100
A2323	Metrology and Instrumentation Engineering	CE	4	-	-	4	25	75	100
A2013	Management Science	HS	4	-	-	4	25	75	100
A2324	Thermal Engineering Lab	CE	-	-	3	2	25	50	75
A2325	Manufacturing Technology Lab	CE	-	-	3	2	25	50	75
TOTAL			**21**	**03**	**06**	**28**	**200**	**550**	**750**

VI SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2014	Probability and Statistics	BS	3	1	-	4	25	75	100
A2326	Nonconventional Energy Sources	CE	3	1	-	4	25	75	100
A2327	Design of Machine Members-II	CE	3	1	-	4	25	75	100
A2328	Heat Transfer	CE	4	-	-	4	25	75	100
A2329	Finite Element Methods	CE	3	1	-	4	25	75	100
INTERDEPARTMENTAL ELECTIVE - I		HS	4	-	-	4	25	75	100
A2331	Heat Transfer Lab	CE	-	-	3	2	25	50	75
A2332	Metrology and Instrumentation Lab	CE	-	-	3	2	25	50	75
TOTAL			**20**	**04**	**06**	**28**	**200**	**550**	**750**

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R14

VII SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2333	Operations Research	CE	4	-	-	4	25	75	100
A2334	CAD/CAM	CE	3	1	-	4	25	75	100
A2335	Computational Fluid Dynamics	CE	4	-	-	4	25	75	100
A2336	Refrigeration and Air Conditioning	CE	4	-	-	4	25	75	100
INTERDEPARTMENTAL ELECTIVE - II		IE	4	-	-	4	25	75	100
PROFESSIONAL ELECTIVE - I		PE	3	1	-	4	25	75	100
A2343	CAD/CAM Lab	CE	-	-	3	2	25	50	75
A2344	Theory of Machines Lab	CE	-	-	3	2	25	50	75
A2345	Mini Project	PW	-	-	-	2	-	50	50
TOTAL			**22**	**02**	**06**	**30**	**200**	**600**	**800**

VIII SEMESTER

Code	Subject	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A2346	Mechanical Vibrations and Structural Dynamics	CE	3	1	-	4	25	75	100
PROFESSIONAL ELECTIVE - II		PE	3	1	-	4	25	75	100
PROFESSIONAL ELECTIVE - III		PE	3	1	-	4	25	75	100
A2359	Simulation Lab	CE	-	-	6	2	25	50	75
A2360	Technical Seminar	TS	-	-	6	2	50	-	50
A2361	Comprehensive Viva	CV	-	-	-	2	-	75	75
A2362	Project Work	PW	-	-	12	8	50	150	200
TOTAL			**09**	**03**	**24**	**26**	**200**	**500**	**700**

B. TECH. - MECHANICAL ENGINEERING

REGULATIONS: VCE-R14

ELECTIVES	
INTERDEPARTMENTALAL ELECTIVE - I	
Code	**Subject**
A2235	Neural Network and Fuzzy Logic
A2154	Air Pollution and Control Methodologies
A2148	Industrial Waste and Waste Management
A2330	Experimental Stress Analysis
A2616	Image Processing and Pattern Recognition
A2448	Digital Electronics and Microprocessors
INTERDEPARTMENTALAL ELECTIVE – II	
A2015	Professional Ethics and Intellectual Property Rights
A2016	Human Resource Management
A2017	Entrepreneurship
A2018	Business Communication
A2019	Project Planning and Management
A2020	Organizational Behaviour
PROFESSIONAL ELECTIVE - I	
A2337	Automobile Engineering
A2338	Theory of Plates and Shells
A2339	Mechatronics
A2340	Boundary Layer Theory
A2341	Nano Technology
A2342	Material Selection for Designing Mechanical Systems
PROFESSIONAL ELECTIVE - II	
A2347	Fuels, Combustion and Environment
A2348	Composite Materials
A2349	Power plant Engineering
A2350	Automation in Manufacturing
A2351	Robotics
A2352	NDT Techniques
PROFESSIONAL ELECTIVE - III	
A2353	Total Quality Management
A2354	Tribology
A2355	Advanced IC Engines
A2356	Fatigue and Fracture Mechanics
A2357	Welding Technology
A2358	Solar energy

SYLLABI FOR
I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

MATHEMATICS - I

Course Code: A2001

L	T	P	C
3	1	0	4

Course Overview:

This course develops the theory of differential equations and indicating its applications. This course deals with more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. Topics include the differential equations of first order and their applications, higher order linear differential equations and their applications, Functions of single variable and multiple integrals, Laplace transforms, Vector integral theorems(Green's, Stoke's and Gauss's divergence theorems). The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Solve the first and higher order linear differential equations.

CO2. Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems.

CO3. Examine extremum of a function of several variables and evaluate the multiple integrals.

CO4. Apply Laplace transforms to solve differential equations.

CO5. Evaluate line, surface and volume integrals using vector integral theorems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

MATHEMAICS-I

Course Code: A2001

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS: Formation of a differential equation – Differential equations of first order and first degree – Linear equation, Bernoulli's equation, Exact equation and equations reducible to exact form - Applications of first order differential equations: Orthogonal trajectories - Newton's law of cooling - Law of natural growth and decay.

UNIT – II

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS: Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $Q(x)$ e^{ax}, $\sin ax$, $\cos ax$, x^n, $e^{ax}V(x)$, $x^nV(x)$-Equations reducible to linear equations with constant coefficients – Cauchy's homogeneous linear equation – Legendre's linear equation - Method of variation of parameters - Applications of second order linear differential equations: L C R Circuits - Simple Harmonic Motion.

UNIT – III

FUNCTIONS OF SINGLE AND SEVERAL VARIABLES, MULTIPLE INTEGRALS: Mean Value Theorems **–** Rolle's theorem -Lagrange's mean value theorem – Cauchy's mean value theorem - Generalized mean value theorem (all theorem statements and their verification). Functions of several variables – Jacobian - Functional dependence - Taylor's theorem for functions of two variables - Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers. Multiple integrals - Double integrals - Change of variables in double integrals- Change of order of integration - Triple integrals.

UNIT – IV

LAPLACE TRANSFORM AND ITS APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS: Laplace transforms of elementary functions - First shifting theorem - Change of scale property - Multiplication by t^n- Division by t -Laplace transforms of derivatives and integrals - Second shifting theorem – Laplace transforms of some special functions: Unit step function – Dirac's delta function - Periodic function - Evaluation of integrals by Laplace transforms- Inverse Laplace transforms - Method of partial fractions - Other methods of finding Inverse Laplace transforms - Convolution theorem - Applications of Laplace transforms to ordinary differential equations.

UNIT-V

VECTOR CALCULUS: Scalar and vector point functions - Gradient, divergence, curl and their related properties - Solenoidal and irrotational vector point functions - Scalar potential function - Laplacian operator - Line integral - Work done - Surface integral - Volume integral - Vector integral theorems: Green's theorem in a plane - Stoke's theorem – Gauss's divergence theorem (all theorem statements and their verification).

TEXT BOOKS:

1. B S Grewal (2012), Higher Engineering Mathematics, 42nd Edition, New Delhi, Khanna Publishers.
2. B V Ramana (2010), Engineering Mathematics, New Delhi, Tata Mc Graw Hill Publishing Co. Ltd.,

REFERENCE BOOKS:

1. Kreyszig Ervin, Advanced Engineering Mathematics, 10th *Edition,* New Jersy, John *Wiley* &Sons
2. T K V Iyengar, B Krishna Gandhi & Others. (2011), Engineering Mathematics Vol - I, Tenth Revised Edition, New Delhi, S.Chand & Co.Ltd.,
3. H K Dass, Er Rajnish Varma (2012), Higher Engineering Mathematics, Second Revised Edition, New Delhi, S Chand and Co.Ltd.,

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Physics

Course Code: A2002

L	T	P	C
4	0	0	4

Course Overview:

Engineering physics is the study of the combined disciplines of physics, engineering and mathematics in order to develop an understanding of the interrelationships of these three disciplines. Fundamental physics is combined with problem **solving** and engineering skills, which then has broad applications. Career paths for Engineering physics are usually "engineering, applied science or applied physics through research, teaching or entrepreneurial engineering". This interdisciplinary knowledge is designed for the continuous innovation occurring with technology.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.

CO2. Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.

CO3. Categorize nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.

CO4. Categorize magnetic materials and objective their role in science and technology. Apply magnetism to explain superconductivity.

CO5. Illustrate working of a laser and examine the communication systems using optical fibers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Physics

Course Code: A2002

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I

INTRODUCTION TO CRYSTALLOGRAPHY: Space lattice, Unit cell, lattice parameters, Atomic radius, co-ordination number and packing factor of SC, BCC, FCC, and diamond, Miller indices, Crystal planes and directions, Interplanar spacing of orthogonal crystal systems.

X-RAY DIFFRACTION: Basic principles of X-ray diffraction, Bragg's law, Laue method, Rotating Crystal Method, Powder method, applications of X- ray diffraction.

UNIT – II

PRINCIPLES OF QUANTUM MECHANICS: Waves and particles, De Broglie hypothesis, matter waves, Davisson and Germer experiment, G. P. Thomson experiment, Schrödinger's time independent wave equation, Application of Schrodinger equation (particle in one dimensional potential box).

SEMICONDUCTOR PHYSICS: Intrinsic and Extrinsic Semiconductors, p-n junction diode, Forward and reverse bias, V-I characteristics, Fermi level in Intrinsic and Extrinsic semiconductors (qualitative), Applications of Semiconductors (LED).

UNIT – III

NANO SCIENCE: Origin of Nano science, Nano scale, surface to volume ratio, Bottom-up and Top-down approaches; Synthesis: Sol-gel, Chemical vapour deposition, physical vapour deposition, pulsed laser vapour deposition methods; Applications of Nanomaterials.

DIELECTRIC PROPERTIES: Electric dipole moment, dielectric constant, Types of polarization (qualitative), Local Field, Clausius – Mossotti Equation, Piezoelectricity and Ferroelectricity and their applications.

UNIT – IV

MAGNETIC PROPERTIES: Magnetic moment, classification of magnetic materials, Weiss theory of ferromagnetism, hysteresis curve, soft and hard magnetic materials and their applications.

SUPERCONDUCTORS: Meissner effect, BCS Theory, Type-I and Type-II Superconductors, High temperature Superconductors, applications of superconductors.

UNIT – V

LASERS: Characteristics of lasers, spontaneous and stimulated emission of radiation, population inversion, Einstein's coefficients, Pumping mechanisms, Ruby laser, Helium-Neon laser, semiconductor diode laser, applications of lasers.

FIBER OPTICS: Principle of optical fiber, acceptance angle, Numerical aperture, types of optical fibers, attenuation of signal in optical fibers, Functioning of Optical Fiber communication system, applications of optical fibers.

TEXT BOOKS:

1. Pillai, S.O., 'Engineering Physics', New Age International,2007.
2. Arumugam, M, 'Engineering Physics', Anuradha Publishers, 2005.

REFERENCE BOOKS:

1. Rajendran, V and Marikani A, 'Engineering Physics' Tata Mc Graw Hill Publications Ltd, III Edition,2004
2. C. Kittel (2009), 'Introduction to Solid State Physics', 8th edition, Wiley Eastern Publications,India.
3. P.Sarah and M. Geetha (2012), 'Engineering Physics and Engineering Chemistry', VGS Booklinks,Hyderabad
4. M. Ratner, D. Ratner (2003), 'Nanotechnology', Pearson Edition, India.
5. P. Sarah (2008), 'Lasers & Optical Fiber communications', IK International (P) Ltd, NewDelhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Chemistry

Course Code: A2003

L	T	P	C
4	0	0	4

Course Overview:

This course will involve minimum lecturing, content will be delivered through assigned reading and reinforced with large and small group discussions, as well as assigned in class (and occasional out of class) group activities. Water and its treatment for various purposes, engineering materials such as plastics, composites, ceramic, abrasives, their preparation, properties and applications, conventional and non- conventional energy sources, nuclear, solar, various batteries, combustion calculations, corrosion and control of metallic materials.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the knowledge of standard electrode potentials of various metals and nonmetals to protect them from corrosion.

CO2. Identify difference and similarities of three types of Batteries.

CO3. Compare different methods of softening of hard water.

CO4. Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.

CO5. Compare and contrast the chemical behavior, properties and applications of engineering substances.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Chemistry

Course Code: A2003

L	T	P	C
4	0	0	4

SYLLABUS

UNIT-I

ELECTROCHEMISTRY: Introduction, Conductance-Specific, Equivalent and Molar conductance, effect of dilution on electrolytic conductance. EMF: Galvanic Cells, Nernst equation, numerical problems. Concept of concentration cells, electro chemical series-applications.

BATTERIES: Primary and secondary cells, (Lechlanche cell, Lead-Acid cell, Ni- Cd cell, Lithium cells). Applications of batteries, Fuel cells: Hydrogen – Oxygen fuel cell, advantages of fuel cells.

CORROSION AND ITS CONTROL: Introduction, causes of corrosion, theories of corrosion – Chemical, Electrochemical corrosion. Corrosion control methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – electroplating, metal cladding. Galvanizing.

UNIT-II

WATER TREATMENT: Introduction to Hardness, causes, expression of hardness, units. Types of hardness, numerical problems. Treatment of water: Internal treatment, types & External treatment: Zeolite process, Ion exchange process and Lime- soda process. Numerical problems on lime- soda and Zeolite process. Treatment of brackish water: Reverse osmosis and Electro dialysis.

UNIT – III

ENGINEERING MATERIALS:

HIGH POLYMERS: Introduction, Types of Polymerization. Plastics: Thermoplastic resins & Thermosetting resins, preparation, properties and engineering applications of plastics: polyethylene, Poly vinyl chloride, Teflon, Nylon. Rubbers: Natural rubber and vulcanization. Synthetic rubbers: Buna-S, Buna-N. Fibers: Polyester- applications. Conducting Polymers: Classification, doping and applications.

MATERIAL CHEMISTRY: Cement- Composition and manufacture of Port land Cement. Lubricants: Criteria of a good lubricant, classification. Refractory: Criteria of a good refractory, classification. Insulators & conductors: Classification of insulators. Characteristics of thermal & electrical insulators, Superconductors: Applications of Superconductors.

UNIT-IV

ENERGY SOURCES: Fuels: Classification -Conventional fuels: solid, liquid, gaseous fuels- comparison. Solid fuels: Coal- analysis- proximate and ultimate analysis, significance. Liquid fuels: Petroleum –origin, refining of petroleum. Synthetic petrol: Fischer Tropsch's and Bergius process. Gaseous fuels: Natural gas, Flue gas: Analysis of Flue gas by Orsat's method. Combustion: problems (calculation of amount and volume of oxygen forcombustion).

UNIT – V

PHASE RULE: Gibb's phase rule expression, terms involved: Phase, Component and Degree of Freedom. Significance and limitations of phase rule. Phase diagrams: One component system- Water system. Two component system- Silver- leadsystem.

SURFACE CHEMISTRY: Adsorption:Types of adsorption. Adsorption isotherm: Langmuir adsorption isotherm, applications of adsorption. Colloid: Classification of colloids. Properties of colloid: Electrical & optical properties. Applications of colloids: Natural and industrial applications.

Nanomaterials: Introduction, preparation and applications of nanomaterial.

TEXT BOOK:

1. S. S Dara & Mukkanti, (2006). Engineering Chemistry, S. Chand & Co. New Delhi.

REFERENCE BOOKS:

1. PC Jain & Monica Jain, (2008). Engineering Chemistry, Dhanpatrai Publishing Company.
2. K.N Mishra, R.P Mani &B. Rama Devi(2009). Chemistry of Engineering Materials, CENGAGE.
3. J.C Kuriacase & J Raja ram (2004), Engineering Chemistry, Tata McGraw Hills Co. NewDelhi

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Computer Programming

Course Code: A2501

L	T	P	C
3	1	0	4

Course Overview:

The course is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures, union and enumerations is also importantly discussed. The console I/O and file I/O systems are explained with the wide variety of examples and applications. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components

CO2. Select the right identifiers, data types and operators for effective computation.

CO3. Write programs, demonstrating use of control statements, arrays and strings.

CO4. Demonstrate use of functions and pointers by writing programs.

CO5. Write programs for simple real life problems using structures and unions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Computer Programming

Course Code: A2501

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO COMPUTERS: Introduction to computers, computer systems, computing environments, computer languages, creating and running programs, software development method, algorithms, pseudo code, flow charts, applying the software development method.

INTRODUCTION TO C LANGUAGE: Basic structures of C language, C tokens, data types and sizes, declaration of variables, assigning values

OPERATORS AND EXPRESSIONS: Statements, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bitwise operators, type conversions, expressions and evaluation, input and output statements, sample programs.

UNIT - II

CONTROL STATEMENTS: If and switch statements, while, do while and for statements, sample programs.

FUNCTIONS: Defining and accessing, passing arguments, function prototypes, library functions, static functions, user defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, example C programs.

ARRAYS: Defining and processing, one dimensional and two dimensional arrays, initialization, passing arrays to a function, multi-dimensional arrays, command line arguments.

UNIT - III

STRINGS: Defining and operations on strings, string variables declaration, reading, writing. Basics of functions, parameter passing, string handling functions.

POINTERS: Basic Concepts, pointer to pointer, passing pointers to a function, operations on pointers, pointer arithmetic, pointers and arrays, arrays of pointers, function pointers, dynamic memory allocation.

UNIT - IV

STRUCTURES AND UNIONS: Structure definition, initializing, assigning values, passing of structures as arguments, arrays of structures, pointers to structures, self-reference to structures, unions, typedef, bit fields, sample programs.

UNIT - V

CONSOLE AND FILE I/O: File, types of files, file vs. console, file structure, file attributes, file operations, standard I/O, formatted I/O, sample programs.

TEXT BOOKS:

1. B. A. Fouruzan and R. F. Gilberg (2006), *Computer Science: A structured programming approach using C,* 3rd edition, Thomson Publications, NewDelhi.
2. Yashawanth Kanethkar (2008), *Let us C*, 8th edition, Jones & Bartlett Publishers,India.

REFERENCE BOOKS:

1. Herbert Schildt (2000), *C: The Complete Reference*, 4th Edition, New Delhi, Osborne Mc GrawHill.
2. B. W. Kerninghan, Dennis M. Ritche (1988), *The C Programming Language*, 2nd edition, Prentice Hall Software Series, India.
3. Stephen G. Kochan (2004), *Programming in C*, 3rd Edition, Pearson Education PrivateLimited.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Mechanics-I

Course Code: A2301

L	T	P	C
4	0	0	4

Course Overview:

Engineering Mechanics is the branch of science for analyzing force systems that acts upon the bodies at either at rest or in motion. The knowledge of mechanics helps us in designing the various parts of machine elements. The course content is designed in such a way that the balancing of various mechanical systems could be achieved by the calculations of center of gravity and moment of inertia. The effects of friction and the consequences of frictional forces on the mating parts will be analyzed to design various systems with negligible effort loss. The principle of virtual work helps us in designing the systems of having structural integrity.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the laws of mechanics to evaluate the resultant force.

CO2. Construct free body diagram and to solve the problems by using equations of equilibrium.

CO3. Analyze the frictional forces to maintain the equilibrium of system.

CO4. Identify the location of centre of gravity and moment of inertia of a body by using principle of moments.

CO5. Solve the structural problems by using principle of virtual work.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

Engineering Mechanics-I

Course Code: A2301

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO ENGINEERING MECHANICS: Basic concepts, Systems of forces – coplanar concurrent forces – Components in space – Moment of force and its application – Couples and resultant of force systems.

EQUILIBRIUM OF SYSTEMS OF FORCES: Free body diagrams, Equations of equilibrium of coplanar systems and spatial systems for concurrent forces.

UNIT - II

FRICTION: Types of Friction – Limiting Friction – Laws of Friction – Angle of repose, Equilibrium of body laying on rough inclined plane – Ladder friction – Wedgefriction.

UNIT - III

CENTROID AND CENTER OF GRAVITY: Centroid of lines – Centroid of area - Centroids of composite figures, Theorems of Pappus - Centre of gravity of bodies – Centroids of volumes, Centre of gravity of composite bodies.

UNIT - IV

AREA MOMENT OF INERTIA: Introduction, Moment of inertia – Polar moment of inertia, Radius of gyration - Transfer theorems for moment of inertia – Moment of inertia by integration – Moment of inertia of composite figures, Product of inertia, Transfer formula for product of inertia.

MASS MOMENT OF INERTIA: Introduction, Moment of inertia of masses – Radius of gyration - Transfer formula for mass moment of inertia – Mass moment of inertia by integration – Mass moment of inertia of composite bodies.

UNIT - V

VIRTUAL WORK: Introduction – Principle of virtual work – Applications – Beams, Lifting machines, Simple framed structures.

TEXT BOOKS:

1. Fedinand L. Singer (1998), *Engineering Mechanics*, Harper – Collins Publishers, NewDelhi.
2. A. K. Tayal (2012), *Engineering Mechanics*, Umesh Publications, NewDelhi.

REFERENCES BOOKS:

1. Timoshenko&Young(2013),*EngineeringMechanics*,McGrawHill,India.
2. K.L.Kumar(2009),*EngineeringMechanics*,TataMcGrawHill,NewDelhi.
3. Irving. H. Shames (2004), *Engineering Mechanics*, Prentice-Hall,India.
4. S. S. Bhavikatti, J. G. Rajasekharappa (2014), *Engineering Mechanics*, New Age International,India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

ENGINEERING DRAWING-I

Course Code: A2302

L	T	P	C
0	2	3	2

Course Overview:

This course is an introduction to the students about Engineering drawings that are usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance (such as typefaces and line styles), size, etc. The drawing technique is emphasized on how to draw an object graphically and projection drawing from different point of view.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Construct various types of scales for the design of maps and models.

CO2. Represent the objects using various types of lines and dimensioning rules.

CO3. Make use of the knowledge of geometry and engineering curves for constructions.

CO4. Analyze the objects such as points, lines and regular planes held in different orientations using conventional drawing and CAD tools.

CO5. Visualize the solids held in different orientations using conventional drawing and CAD tools.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

ENGINEERING DRAWING-I

Course Code: A2302

L	T	P	C
0	2	3	2

LIST OF EXPERIMENTS

UNIT - I

INTRODUCTION TO ENGINEERING DRAWING: Drawing instruments and accessories, types of line, lettering practice, rules of dimensioning, geometrical constructions – basic geometrical shapes.

SCALES: Types of scales, Units of length and their conversion. Construction of scales – Plain Scale, Diagonal Scale, Comparative Scale, Vernier Scale and Scale of Chords.

UNIT - II

CURVES USED IN ENGINEERING PRACTICE AND THEIR CONSTRUCTIONS: Conic Sections – construction of ellipse parabola and hyperbola, Special Curves – construction of Cycloid, Epicycloid, Hypocycloid and involutes.

UNIT - III

ORTHOGRAPHIC PROJECTION: Principles of orthographic projections – conventions – first and third angle projections. Projection of points, projection of lines – lines inclined to single plane, lines inclined to both the planes, true lengths and traces.

UNIT - IV

PROJECTION OF PLANES: Projection of regular planes – planes inclined to one plane, planes inclined to both planes, projection of planes by auxiliary plain projection method.

UNIT –V

PROJECTION OF SOLIDS: Projections of regular solids– prisms, cylinders, pyramids, cones. Solids inclined to one plane, Solids inclined to both planes, projection of solid by auxiliary plain projection method.

TEXT BOOKS:

1. N. D. Bhatt (2012), *Engineering Drawing*, 49th Edition, Charotar Publications, NewDelhi.
2. C M Agrawal, Basant Agrawal (2013) *Engineering Drawing*,2th Edition, Tata Mc Graw Hill,India.

REFERENCE BOOKS:

1. Venugopal (2010), *Engineering Drawing and Graphics*, 2nd edition, New Age Publications, NewDelhi.
2. Johle (2009), *Engineering Drawing*, Tata Mc Graw Hill, New Delhi, India.
3. Trymbaka Murthy (2007), *Computer Aided Engineering Drawing*, I.K. International Publishers,NewDelhi.
4. R.B. Choudary (2005), *Engineering graphics with Auto CAD*, Anuradha Publishers, NewDelhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LAB

Course Code: A2008

L	T	P	C
0	0	3	2

Course Overview:

Engineering physics laboratory course includes the experimental methods for the determination of mechanical property (Rigidity modulus of a given material), frequency of an AC signal, basic electronic circuits (LED, RC circuit), and to study characteristics of LASERS & Optical fiber (LASER wavelength, divergence, Numerical aperture of fiber, Losses in fibers). This interdisciplinary knowledge is designed for the continuous innovation occurring with technology.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Improve their pronunciation using the rules of Phonetics.

CO2. Take part in role-plays and interviews to perform effectively in real life situations.

CO3. Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.

CO4. Minimize the stage fear and make presentations with proper body language.

CO5. Adapt the art of debating and group discussion to present their view point convincingly.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

ENGINEERING PHYSICS & ENGINEERING CHEMISTRY LAB

Course Code: A2008

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PHYSICS LAB:

1. Determination of Rigidity modulus (η) of the material of the given wire using a Torsional Pendulum.
2. Determination of Frequency (n) of an AC supply using Sonometer.
3. Study of V-I characteristics of light emitting diode and determination of the Threshold voltage of LED.
4. Study of exponential decay of charge in a R.C. Circuit and determination of time constant of R.C circuit.
5. Determination of numerical aperture of a given optical fiber.
6. Determination of wavelength of a given source of laser light using a plane transmission grating by normal incidence method.
7. Determination of angular divergence of the laser beam.
8. Determination of Dispersive power of material of a prism.

CHEMISTRY LAB:

1. **TITRIMETRY:** Estimation of hardness of water by EDTA method (or) Estimation of calcium in limestone by permanganometry.

INSTRUMENTAL METHODS:

2. **CONDUCTOMETRY:** Conductometric titration of strong acid vs strong base (or) Conductometric titration of mixture of acids vs strong base.

3. **POTENTIOMETRY:** Titration of strong acid vs strong base by potentiometry (or) Titration of weak acid vs strong base bypotentiometry.

PHYSICAL PROPERTIES:

4. Determination of viscosity of sample oil by redwood / ostwald'sviscometer.
5. Determination surface tension oflubricants.
6. **IDENTIFICATION AND PREPARATIONS:** preparation of organic compounds: aspirin (or)benzimidazole.
7. **DEMONSTRATION EXPERIMENTS (ANY ONE OF THEFOLLOWING)**:
   a. Preparation of thiokolrubber
   b. Adsorption on charcoal

TEXT BOOKS:

1. Practical Engineering Physics by Dr. P Sarah, Ms. S Shashi devi, Mr. C. Venkatasubbaiah.
2. Practical Engineering Chemistry by K Mukkanti et.al, B S Publications, Hyderabad.
3. Inorganic quantitative analysis, Vogel.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel.
2. A text book on experiments and calculation engineering chemistry by S.S.Dara.
3. Instrumental methods of chemical analysis by Chatwal, Anand, Himalaya Publications.

VARDAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

COMPUTER PROGRAMMING LAB

Course Code: A2502

L	T	P	C
0	0	6	2

Course Overview:

This hands-on course provides a comprehensive introduction to the ANSI C language, emphasizing portability and structured design. Students are introduced to all major language elements including data types, control statements and preprocessor directives. Thorough treatment is given to the topics of arrays, functions and pointers. The course elucidates the use of structures, unions, and enumerations. Emphasis is given to the processing of command line arguments and file systems, so as to write flexible, user-friendly programs. Comprehensive hands on exercises are integrated throughout to reinforce learning and develop real competency. It is used to program desktop applications, compilers, tools and utilities and even hardware devices.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Implement programs by selecting the right identifiers, data types and operators for effective computation.

CO2. Implement programs, demonstrating use of control statements, arrays and strings.

CO3. Implement programs, demonstrating use of functions and pointers.

CO4. Implement C programs for simple real life problems using structures and unions.

CO5. Implement programs illustrating use of files.

CO6. Debug erroneous programs related to the course.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R14**

COMPUTER PROGRAMMING LAB

Course Code: A2502

L	T	P	C
0	0	6	2

LIST OF EXPERIMENTS

Week – 1 (Operators)

1. Write C programs for thefollowing:
   a) Swapping of two numbers without using a third variable.
   b) Check whether the given number is odd or even using conditional operator.
   c) Read two integers and shift the first integer by two bits to the left and second integer by one bit to the right.

Week – 2 (if and switch statements)

2. Write C programs for the following:
   a) Check whether the input alphabet is a vowel or not.
   b) Find the roots of a quadraticequation.
   c) Perform basic arithmetic operations like addition, subtraction, multiplication, division and modulus of two numbers using switch-case statement. Numbers are assumed to be integers and will be entered by theuser.

Week – 3 (Loops)

3. Write C programs for thefollowing:
   a) Print Armstrong numbers between 1 to n where n value is entered by the user. Armstrong numberisdefinedasthesumofcubesofindividualdigitsofanumber.e.g.371 =3^3+7^3+1^3
   b) Generate the first n terms of the Fibonaccisequence.
   c) Calculate the followingsum:
      Sum=1 + x^2/2! +X^4/4!+---------- up to given 'n'terms.
   d) Generate all the prime numbers between 1 and n, where n value is supplied by theuser.
   e) Find the GCD and LCM of two numbers. Numbers are assumed to be integers and will be entered by theuser.

Week – 4 (Loops)

4. Write C programs for thefollowing:
   a) Print first n lines of the Pascal's Triangle. Pascal's Triangle is a triangular array of the binomial coefficients.

```
                1
            1       1
        1       2       1
    1       3       3       1
```

   b) Print first n lines of Floyd'sTriangle.

```
1
2   3
4   5   6
7   8   9   10
11  12  13  14  15
```

Week – 5 (Arrays)

5. Write C programs for thefollowing:
   a) Find the largest and smallest number among a list ofintegers.
   b) Read a list of elements into an array 45, 14, 78, 36, 64, 9, 25, 99, 11 and find weather a particular element is present in the list or not using linearsearch.
   c) Read a list of elements into an array and print the reverse of thelist.
   d) Read two matrices and find the addition and multiplication of twomatrices.
   e) Find the transpose of amatrix.

e.g.

```
Given matrix 1   2   3
4   5   6
```

Transpose of the matrix:

```
1   4
2   5
3   6
```

Week – 6 (Functions)

6. Write C programs that uses both recursive and non-recursivefunctions:
   a) Find the sum of n naturalnumbers.
   b) Find the factorial of a givennumber.
   c) Find the N^{th} Fibonaccinumber.
   d) Find the reverse of anumber.

Week – 7 (Strings)

7. Write C programs for thefollowing:
   a) Check whether the given string is palindrome or not with and without using stringfunctions.
   b) Insert a sub-string in to given main string from a givenposition.
   c) Find the frequency of a given character in astring.
   d) Delete n characters from a given position in givenstring.

Week – 8 (Pointers)

8. Write C programs for thefollowing:
   a) Reverse a string usingpointers.
   b) Read a list of elements into an array. Find the sum of array elements usingpointers.
   c) Copy the elements of one array to another array usingpointers.
   d) Read two strings and compare these two strings character by character. Display the similar characters found in both the strings and count the number of dissimilarcharacters.

Week – 9 (Structure and Union)

9. Write C programs for thefollowing:
   a) Read the full name and date of birth of a person and display the same using nestedstructure.
   b) Create a Student structure containing name, rollno and grades as structure members. Display the name, rollno and grades of n students by using array of structuresconcept.
   c) Create a Book structure containing name, author and pages as structure members. Pass the address of structure variable to a user defined function and display thecontents.
   d) Create a Result union and Result structure containing marks and grades as members. Find the size of union and number of bytes reserved forit.

Week – 10 (Enumerated Data Types, Typedef, Bit Fields, Pre-processor Directives)

10. Write C programs for thefollowing:
    a) Create enumerated data type for 7 days of a week. Display their values in integerconstants.
    b) Find the biggest number among two numbers using a parameterizedmacro.
    c) Create a student structure using typedef containing id, name and age as structure members. Declare a bit field of width 3 for age and display the studentdetails.

Week – 11 (Command line arguments)

11. Write C programs for thefollowing:
    a) Pass n number of arguments at the command line and display total number of arguments and theirnames.
    b) Add two numbers using command linearguments.

Week – 12 (Files)

12. Write C programs for thefollowing:
    a) Copy the contents of one file toanother.
    b) Merge the contents of two files and store it in a thirdfile.
    c) Read name and marks of n number of students from user and store them in afile.

Week – 13 (Additional Programs)

13. Write C programs for thefollowing:
    a) Find the 2's compliments of a binarynumber.
    b) Convert a Roman numeral to its decimalequivalent
    c) Count the number of lines, words and characters in a givenstring.
    d) Concatenate two given strings without using built-in function.
    e) Demonstration of dynamic memory allocation functions with example.

REFERENCE BOOKS:

1. Pradip Dey, Ghosh Manas (2009), *Programming in C,* Oxford University Press, USA.
2. E. Balaguruswamy (2009), *C and Data Structures,* 5th Edition, TMH publications,India.
3. M.K. Jain, S.R.K. Iyengar & R.K. Jain (2007), *Numerical Methods for Scientific and Engineering Computation,* 5th edition, New Age International Publishers, NewDelhi.
4. Aitkinson, Han (2006), *Elementary Numerical Analysis*, 3rd Edition, John Wiley & Sons (Asia) Private Ltd.,India.

SYLLABI FOR
II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

TECHNICAL ENGLISH

Course Code: A2005

L	T	P	C
4	0	0	4

Course Overview:

The basic idea behind offering Technical English as a subject at the undergraduate level is to acquaint students with a language held by common consent to be the most popular language. The lessons included as part of syllabus, aim to take the nuances of English to students as it reveals its strengths and complexity when used to perform a variety of functions such as present technical seminars, prepare technical papers, abstracts, write effective business, formal and job application letters, publish articles, etc. For prospective engineers, nothing could be more useful or productive than being able to reach out to the world of technology and business through communication skills.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service

CO2. Perceive the importance of technological impact on society and plan for the technological advancement

CO3. Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations

CO4. Build creativity for career planning and entrepreneurship

CO5. Develop effective written communication skills in academic writing

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

TECHNICAL ENGLISH

Course Code: A2005

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I

Chapter entitled ***Heaven's Gate*** From Enjoying Everyday English published by Orient Black Swan, Hyderabad. Chapter entitled ***Mother Teresa*** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar: Articles – Prepositions.

Vocabulary: Word formation with Prefixes and suffixes – Synonyms and Anonyms –Homonyms, Homophones and Homographs – Idiomatic Expressions –Phrasal Verbs.

Writing: Paragraph Writing.

UNIT II

Chapter entitled ***The Connoisseur*** From Enjoying Everyday English published by Orient Black Swan, Hyderabad. Chapter entitled ***Sam Pitroda*** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar: Concord (Subject verb Agreement) - Adjectives and Degrees of Comparisons.

Vocabulary: Word formation with Prefixes and suffixes- Synonyms and Anonyms- Collocations- One word substitute.

Writing: Letter Writing: Types of letters, Styles of letters, Parts of letters, Letter of Apology and reply, Letter of Complain and Reply.

Unit III

Chapter entitled ***The Odds Against Us*** from Enjoying Everyday English published by Orient Black Swan, Hyderabad. Chapter entitled ***I have a Dream by Martin Luther King*** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar: Tenses, Question Tags.

Vocabulary: Technical Vocabulary, Word formation with Prefixes and suffixes- Synonyms and Anonyms Morphemes.

Writing: Speech Writing, Dialogue and Speech Writing, Writing Technical Articles.

UNIT IV

Chapter entitled ***The Cuddalore Experience*** *From* Enjoying Everyday English published by Orient Black Swan, Hyderabad.

Grammar: Active and Passive Voice,

Vocabulary: Synonyms and Anonyms, Words often confused/misspelled.

Writing: Letter of Application and Preparation of Resume.

UNIT V

Chapter entitled ***Obama*** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar: Simple, Compound and Complex - Direct and indirect Speech.

Vocabulary: One word substitutes and Technical Vocabulary.

Writing: Report Writing –Types of reports, importance of Reports, Styles of Reports, Structure of Reports – Writing informational, Progress Reports and Analytical Reports in Technical Contexts.

TEXT BOOKS:

1. A Ramakrishna Rao (2009) *Enjoying Everyday English. Hyderabad: Sangam Books*
2. B Yadava Raju and C Muralikrishna (2009). *Inspiring Speeches and Lives*. Guntur: Maruthi Publications
3. Meenakshi Raman & Sangeeta Sharma, (2009), *Technical Communication,* Oxford University Press.

REFERENCE BOOKS:

1. Ashraf Rizvi, M (2005) *Effective Technical Communication*. New Delhi: Tata Mc Graw Hill.
2. David Green (2010) *Contemporary English Grammar Structures and Composition* by, MacMillan Publishers, NewDelhi.2010.
3. Meenakshi Raman, *Business Communication with CD*, 2nd Edition, Oxford University Press.
4. Meenakshi Raman, *Technical Communication*, Oxford University Press.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IISemester **VCE-R14**

MATHEMATICS – II

Course Code: A2006

L	T	P	C
3	1	0	4

Course Overview:

This course focus on basic areas of theory and more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. Topics to be covered in this course include: solution for linear systems, Eigen values & Eigen vectors, linear transformations, partial differential equations, Fourier series, Fourier transforms & Z - transforms. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Solve** system of linear equations using rank of a matrix.

CO3. **Examine** the nature of the Quadratic form by eigen values and eigen vectors.3

CO3. **Classify** and solvePartial differential equations.

CO4. **Develop** Fourier series and Fourier transforms of a function.

CO5. **Apply** Z- Transforms to solve difference equations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEII Semester **VCE-R14**

MATHEMATICS-II

Course Code: A2006

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

THEORY OF MATRICES: Real matrices: Symmetric, skew – symmetric and orthogonal matrices - Complex matrices: Hermitian, Skew - Hermitian and Unitary matrices - Elementary row and column transformations - Elementary matrix - Finding rank of a matrix by reducing to Echelon form and Normal form - Finding the inverse of a matrix using elementary row/column transformations (Gauss-Jordan method) - Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix - Solving $m \square n$ and $n \square n$ linear system of equations by Gausselimination- Cayley-HamiltonTheorem(StatementandVerification) - Finding inverse and powers of a matrix by Cayley-Hamilton theorem.

UNIT – II

LINEAR TRANSFORMATIONS: Linear dependence and independence of vectors - Linear Transformation, Orthogonal Transformation - Eigen values and eigen vectors of a matrix - Properties of eigen values and eigen vectors of real and complex matrices - Diagonalization of a matrix.

Quadratic forms up to three variables - Rank, Index, Signature and Nature of quadratic form - Reduction of a quadratic form to canonical form using linear and orthogonal transformations.

UNIT – III

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations - Equations reducible to standard forms - Method of separation of variables for second order equations.

UNIT – IV

FOURIER SERIES: Determination of Fourier coefficients - Fourier series in an arbitrary interval - Fourier series of even and odd functions - Half-range Fourier sine and cosine expansions.

UNIT – V

FOURIER TRANSFORMS: Fourier integral theorem (statement) - Fourier sine and cosine integrals - Fourier transforms - Fourier sine and cosine transforms - Properties - Inverse transforms - Finite Fourier transforms.

Z-TRANSFORMS: Definition - Some standard Z-transforms - Damping rule - Shifting rule - Multiplication by n - Initial and final value theorems - Inverse Z-transforms using partial fractions - Convolution theorem - Solution of difference equations by Z - transforms.

TEXT BOOKS:

1. B S Grewal (2012), *Higher Engineering Mathematics*, 42nd Edition, New Delhi, Khanna Publishers.
2. B V Ramana (2010), *Engineering Mathematics*, New Delhi, Tata Mc Graw Hill Publishing Co. Ltd

REFERENCE BOOKS:

1. Ervin Kreyszig, *Advanced Engineering Mathematics,* 10th *Edition,* New Jersy, John *Wiley* &Sons.
2. T K V Iyengar, B Krishna Gandhi & Others. (2011), *Mathematical Methods*, Tenth Revised Edition, New Delhi, S. Chand & Co. Ltd.
3. HKDass,ErRajnishVarma(2012),*HigherEngineeringMathematics*,SecondRevisedEdition,NewDelhi,S. Chand & Co. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

NUMERICAL METHODS

Course Code: A2007

L	T	P	C
3	1	0	4

Course Overview:

This course is a study of probability theory and numerical techniques used to model engineering systems. Topics in probability include: basic axioms of probability, Baye's Theorem, random variables, discrete and continuous probability distributions. It involves the development of mathematical models and the application of the computer to solve engineering problems using the following computational techniques: root-finding using bracketing and open methods, Interpolation, numerical differentiation, numerical integration, linear and polynomial curve fitting and the solution of differential equations using single step methods and multi -step methods.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Employ different numerical methods to obtain approximate solutions to algebraic and transcendental equations. Calculate the unknowns of a linear equation set using iterative solution techniques.

CO2. Illustrate different numerical methods for interpolation.

CO3. Apply finite differences to obtain the value of derivatives at given point from the data provided and analyze various methods for numerically solving integration of functions.

CO4. Determine how to fit the best polynomial or special function curve passing from experimental data points using least-square method.

CO5. Solve numerically initial-value problems of ordinary differential equations (ODEs) of first order.

CO6. Apply finite difference approximations to solve numerically boundary value problems of Partial differential equations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

NUMERICAL METHODS

Course Code: A2007

L	T	P	C
3	1	0	4

SYLLABUS

UNIT- I

ALGEBRAIC AND TRANSCENDENTAL EQUATIONS AND SOLUTIONS OF LINEAR EQUATIONS:
Bisection method - Regula-falsi method - Iteration method - Newton-Raphson method. Iterative methods of solution of system of equations: Jacobi's iteration method – Gauss-Seidel iteration method.

UNIT- II

FINITE DIFFERENCES AND INTERPOLATION: Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Differences of a polynomial – Missing terms - Newton's interpolation formulae – Central difference interpolation formulae: Gauss's forward and backward interpolation formulae and Stirling's formula – Interpolation with unequal intervals: Lagrange's interpolation formula.

UNIT-III

NUMERICAL DIFFERENTIATION & INTEGRATION AND CURVE FITTING: Numerical differentiation: Derivatives using Newton's interpolation formulae, Stirling's formula. Numerical integration: Newton-cotes quadrature formula - Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth rule.

Curve Fitting: Method of least squares - Fitting a straight line, second degree parabola and non-linear curves of the for$y = ae^{bx}$, $y = ax^{b}$, $y = ab^{x}$ by the method of least squares.

UNIT-IV

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Taylor's series method – Picard'smethod - Euler's - modified Euler's Method - Runge-Kutta method of fourth order - Predictor and Corrector methods: Milne's method Adams-Bashforth method- Solution of twopoint boundary value problem (Shooting Method)

UNIT-V

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS: Classification of second order partial differential equations – finite difference approximations to derivatives - Elliptic equations: Solution of Laplace equation by Liebmann's iteration process - Parabola equations: Solution of one dimensional heat equation by Schmidt explicit method and Crank-Nicolson implicit method.

TEXT BOOKS:

1. S S Sastry (2005), *Introductory Methods of Numerical Analysis*, Fourth Edition, New Delhi, PHI Learning Pvt.Ltd.
2. M K Jain and S R K Iyengar (2007), *Numerical Methods for Scientific and Engineering Computation*, 5th Edition, New Age International Publishers, NewDelhi.

REFERENCE BOOKS:

1. B S Grewal (2012), *Higher Engineering Mathematics*, 42nd Edition, Khanna Publishers, New Delhi.
2. T K V Iyengar, B Krishna Gandhi & Others (2013), *Numerical Methods*, Second Revised Edition, New Delhi, S. Chand & Co. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

BASICELECTRONICS

Course Code: A2403

L	T	P	C
3	1	0	4

Course Overview:

This course covers fundamental topics that are common to a wide variety of analog and digital electronics. This course starts with basics of semiconductors, review the operation and characteristics of semiconductor devices (namely, semiconductor diodes and BJTs), and buildup to more advanced topics in analog circuit designs. This course also focuses on the fundamentals of number systems, Boolean algebra and logic gates. This course enables the students to have exposure in inter-disciplinary concepts.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze the physical behavior of diodes and transistors.

CO2. Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations.

CO3. Analyze single stage amplifier circuits using small signal low frequency transistor model.

CO4. Distinguish between the concepts of negative and positive feedback in amplifiers and analyze various feedback amplifiers and oscillator circuits.

CO5. Apply the knowledge of number systems and Boolean algebra in minimizing Boolean functions and realizing logic gates.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

BASICELECTRONICS

Course Code: A2403

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

DIODE AND ITS CHARACTERISTICS: P-N junction diode, operation in forward and reverse bias conditions, V-I characteristics, Zener diode and its characteristics, rectifiers - half wave, full wave and bridge rectifiers (simple problems), Filters (qualitative treatment), voltage regulation using Zener diode.

UNIT - II

TRANSISTORS: Bipolar Junction Transistor (BJT) - construction, operation, CE, CB and CC transistor configurations and characteristics.

BJT BIASING: Need for biasing, operating point, load line analysis, biasing and stabilization techniques: fixed bias, collector to base bias, self-bias.

UNIT – III

BJT AMPLIFIERS: Transistor as an amplifier, ABJT h-parameter model, analysis of transistor amplifier using h- parameter model, CE, CB and CC amplifiers, comparison of CB, CE and CC configurations, Simplified h-parameter model.

UNIT – IV

FEEDBACK AMPLIFIERS: Concept of feedback, classification of feedback amplifiers, general characteristics of negative feedback amplifiers, effect of negative feedback on input and output resistances.

OSCILLATORS: Condition for oscillations, RC Phase shift oscillator with transistor, Wein bridge oscillator, Hartley and Colpitts oscillator.

UNIT – V

DIGITAL SYSTEMS AND BINARY NUMBERS: Digital systems, binary numbers, number base conversions, octal, hexadecimal numbers and complements.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, digital logic gates.

TEXT BOOKS:

1. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), *Electronic Devices and Circuits*, 3rd edition, Tata McGraw Hill, NewDelhi.
2. M. Morris Mano, Michael D. Ciletti (2008), *Digital Design*, 4th Edition, Pearson Education Inc, India.

REFERENCE BOOKS:

1. G. K. Mittal (1999), *Electronic Devices and Circuits*, 22nd edition, Khanna Publications, New Delhi.
2. S. Shalivahanan, N. Suresh Kumar, A. Vallavaraj (2007), *Electronic Devices and Circuits*, 3rd edition, McGraw Hill, New Delhi, India.
3. Zvi. Kohavi (2004), *Switching and Finite Automata Theory*, Tata McGraw Hill, India.
4. C. V. S. Rao (2009), *Switching and Logic Design*, 3rd Edition, Pearson Education, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGINEERING MECHANICS-II

Course Code: A2303

L	T	P	C
4	0	0	4

Course Overview:

This is second course in Engineering Mechanics - which is the study of the interaction of matter and forces in engineering contexts. It is evident that all objects in the world around us are composed of matter and they are all subject to forces. As such- Engineering Mechanics is a foundational tool for engineers and forms the underlying basis for understanding more advanced fields such as Solid Mechanics - Fluid Dynamics - Rigid Body Dynamics – Aerodynamics – Structures – and Control.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** Newton's three laws of motion and determine the relation between force and acceleration of particles in motion.

CO2. **Contrast** rectilinear and curvilinear motion of particles and find the relation between force and acceleration of kinetic bodies.

CO3. **Differentiate** potential and kinetic energy - and solve the problems using conservative energy principle

CO4. **Utilize** the Impulse-Momentum principles to problems involving impact.

CO5. **Define** the types and vibrations and utilize them to analyze the problems related to pendulums.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGINEERING MECHANICS-II

Course Code: A2303

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

KINEMATICS: Kinematics – Kinetics – Newton laws of motion – Particle – Rigid body – Path of particle. Introduction to Translation, Rotation and Plane motion of a rigid body.

UNIT - II

RECTILINEAR TRANSLATION: Kinematics of rectilinear motion, Principles of dynamics – Differential equation of rectilinear motion – Motion of a particle acted upon by a constant force, Force as a function of time – Force proportional to displacement.

CURVILINEAR TRANSLATION: Kinematics of curvilinear motion – Differential equations of curvilinear motion of a projectile – D'Alembert's principle – Moment of momentum – work and energy in curvilinear motion.

UNIT - III

WORK AND ENERGY: Work Done by a Force and a System of Forces, Work done by a Varying force, Energy – Potential Energy, kinetic Energy of a Particle, Kinetic Energy of a Rigid Body in Rotation and in Plane motion, Work and Energy Principle, Law of Conservation of Energy.

UNIT - IV

IMPULSE AND MOMENTUM: Introduction to momentum – impulse, Principle of Linear Impulse and Linear Momentum, Conservation of Linear Momentum, Direct Central Impact, Coefficient of Restitution, Angular momentum.

UNIT - V

MECHANICAL VIBRATIONS: Definitions, Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums and its Applications.

TEXT BOOKS:

1. Fedinand L. Singer (1998), *Engineering Mechanics*, Harper – Collins Publishers, New Delhi.
2. A. K. Tayal (2012), *Engineering Mechanics*, Umesh Publications, New Delhi.

REFERENCE BOOKS:

1. Timoshenko &Young(2013), *Engineering Mechanics*, McGraw Hill, India.
2. K.L Kumar (2009), *Engineering Mechanics*, Tata McGraw Hill, New Delhi.
3. Irving. H. Shames (2004), *Engineering Mechanics*, Prentice-Hall, India.
4. S. S. Bhavikatti, J. G. Rajasekharappa (2014), *Engineering Mechanics*, New Age International, India.
5. G. K. Grover, (2009), *Mechanical Vibrations*, Nem Chand & Brothers, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGINEERING DRAWING-II

Course Code: A2304

L	T	P	C
0	2	3	2

Course Overview:

This course is an introduction to the students about Engineering drawings that are usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance (such as typefaces and line styles), size, etc. The drawing technique is emphasized on how to draw an object graphically and projection drawing from different point of view.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Develop** the lateral surface of regular solids.

CO2. **Imagine** the sectional views and curves of intersections of regular solids

CO3. **Analyze** isometric projections of objects such as regular planes and solids using conventional drawing and CAD tools.

CO4. **Convert** isometric views to orthographic views & vice versa.

CO5. **Visualize** the perspective projections of regular planes and solids using conventional drawing and CAD tools.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGINEERING DRAWING-II

Course Code: A2304

L	T	P	C
0	2	3	2

LIST OF EXPERIMENTS

UNIT - I

SECTIONS OF SOLIDS: Sections of prisms, pyramids, cylinders and cones.

DEVELOPMENT OF SURFACES: Development of lateral surface of right regular solids – prisms, cylinders, pyramids and cones.

UNIT - II

INTERSECTION OF SOLIDS: Intersection of two cylinders, cylinder and prism, cylinder and cone, prism and prism.

UNIT – III

ISOMETRIC PROJECTIONS: Principle of isometric projection, isometric scale, isometric projections and isometric views, Isometric projections of planes, prisms, cylinders, pyramids, and cones.

UNIT - IV

TRANSFORMATION OF PROJECTIONS: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric views.

UNIT - V

PERSPECTIVE PROJECTIONS: Concept of perspective projection, Terminology in perspective projection, methods of perspective projection – Vanishing Point method, Visual Ray method.

INTRODUCTION TO COMPUTER AIDED DRAFTING: Introduction, Advantages of CAD, CAD work station, introduction to CAD Software.

TEXT BOOKS:

1. N. D. Bhatt, V. M. Panchal (2012), *Engineering Drawing***,** 49th Edition, Charotar Publishing House, Gujarat.
2. C M Agrawal, Basant Agrawal (2013) *Engineering Drawing*, 2nd Edition, Tata McGraw Hill, India.

REFERENCE BOOKS:

1. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), *Engineering Graphics with AutoCAD*, PHI Learning Private Limited, New Delhi.
2. Arshad Noor Siddiquee, ZahidAkhtar Khan, Mukhtar Ahmad (2006), *Engineering Drawing with a Primer on AutoCAD,* 2nd Edition, Prentice Hall, India.
3. Jolhe, Dhananjay (2006), *Engineering Drawing: With an Introduction to CAD*, Tata McGraw Hill, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Code: A2009

L	T	P	C
0	0	3	2

Course Overview:

The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint the students with a language that enjoys currently as a lingua franca of the globe. In the ELCS lab the students are trained in Communicative English Skills: phonetics, word accent, word stress, rhythm and intonation, making effective oral presentations- both extempore and Prepared- seminars, group discussions, presenting techniques of writing, role play, telephonic skills, asking and giving directions, information transfer, debates, description of person, place, objects etc. The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises on grammar, vocabulary, listening and pronunciation games, etc.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Improve their pronunciation using the rules of Phonetics.

CO2. Take part in role-plays and interviews to perform effectively in real life situations.

CO3. Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.

CO4. Minimize the stage fear and make presentations with proper body language.

CO5. Adapt the art of debating and group discussion to present their view point convincingly.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Code: A2009

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

The Language lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

SYLLABUS:

The following course content is prescribed for the English Language Laboratory sessions:

1. Introduction to phonetics
2. Sounds of English- vowels, diphthongs &consonants
3. Introduction to stress and intonation
4. Oral presentations-prepared
5. Oral Presentations-Extempore
6. Situational dialogues / role play
7. 'Just A Minute' sessions(JAM)
8. Information transfer
9. Telephoning skills
10. Describing objects, situations and people
11. Giving directions
12. Listening for specific information
13. Listening to record telephone conversations
14. Debate

SUGGESTED SOFTWARE:

- Cambridge advanced learners' English dictionary with CD.
- The Rosetta stone English library.
- Clarity pronunciation power – part I.
- Oxford advanced learner's compass, 7thEdition.
- Learning to speak English - 4CDs.
- Vocabulary in use, Michael McCarthy, felicity o'den, Cambridge.
- Murphy's English grammar, Cambridge with CD.

REFERENCE BOOKS:

1. SureshKumar.E.&SreehariP.A*(*2007),*HandbookforEnglishLanguageLaboratories,*CambridgeUniversity Press India Pvt. Ltd, New Delhi.
2. Mandal S. K (2006), *Effective Communication & Public Speaking*, Jaico Publishing House, New Delhi.
3. Grant Taylor (2004), *English Conversation Practice,* Tata McGraw Hill, New Delhi.
4. Balasubramanian .T (2000), *A text book of English Phonetics for Indian Student, Mac* Millan Publishers, India.
5. Kamalesh Sadanand, Susheela Punitha (2008), *Spoken English: A foundation Course: Parts 1 & 2,* New Delhi, Orient Longman Pvt. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

Engineering Workshop Practice Lab

Course Code: A2305

L	T	P	C
0	0	3	2

Course Overview:

This course provides comprehensive knowledge of the various trades and tools used in an Engineering workshop. It emphasizes on the use of various workshop tools with safety aspects. The essence of this lab is also to make the students know about identifying hardware devices in PC, hardware assembling and disassembling, and internet capabilities and understand the usage different software's like MSOffice.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Identify** the tools and equipment utilized in workshop.

CO2. **Choose** the required trade for the suitable operations.

CO3. **Make** the Wooden joints, MS fittings, house wiring, sheet metal components and simple forgings.

CO4. **Explain** the working of Arc Welding and Plumbing operations, uses of power tools and Installation of Software in the computer systems.

CO5. **Prepare** the documents, data sheets and power point slides by using the Microsoft office tools

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R14**

Engineering Workshop Practice Lab

Course Code: A2305

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. TRADES FOREXERCISES:

Minimum two exercises in each of the following trades

a. Carpentry
b. Fitting
c. House Wiring
d. Tin-Smithy
e. Foundry

2. TRADES FORDEMONSTRATION:

a. Black Smithy
b. Arc Welding
c. Gas Welding
d. Plumbing

TEXT BOOKS:

1. H. S. Bawa (2007), *Workshop Practice,* Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. A. Rajendra Prasad & P. M. M. S. Sarma (2002), *Workshop Practice*, SreeSai Publication, New Delhi.

REFERENCE BOOKS:

1. K. Jeyachandran, S. Natarajan, S. Balasubramanian (2007), *A Primer on Engineering Practices Laboratory*, Anuradha Publications, NewDelhi.
2. T. Jeyapoovan, M. Saravanapandian, S. Pranitha (2006), *Engineering Practices Lab Manual*, Vikas Publishing House Private Limited, New Delhi.
3. S. K. Hajra Choudhury, A. K. Hajra Choudhury (2009), *Elements of Workshop Technology Vol 1,* Meidia Promoters, India.

SYLLABI FOR
III SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MECHANICS OF SOLIDS

Course Code: A2307

L	T	P	C
3	1	0	4

Course Overview:

Mechanics of solids is that branch of engineering Science, which plays a critical role in determining the behavior of materials by applications of mechanical loads and there by design of various components to meet the modern engineering applications. This course emphasizes on the concepts of stress, strain and deformation applied to bars, beams, columns and cylinders etc.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** the basics of material properties and concepts of stress-strain relationships for homogenous, isotropic materials.

CO2. **Analyze** the structural members and machine parts under axial load, shear load, bending moment and torsional moment.

CO3. **Determine** the deflections and deformations of loaded flexural members

CO4. **Calculate** stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.

CO5. **Build** the necessary theoretical background for further structural analysis and design courses.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MECHANICS OF SOLIDS

Course Code: A2307

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

SIMPLE STRESSES AND STRAINS: concept of stress, strain and elasticity, types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, working stress, factor of safety, lateral strain, poisson's ratio, volumetric strain. Elastic moduli and their relationship between them. Bars of varying cross section, composite bars, thermal stresses, principal stresses, Strain energy, resilience. Gradual, sudden and Impact loadings. Stresses on inclined planes – uniaxial stress and biaxial stress, Mohr's circle.

UNIT - II

SHEAR FORCE AND BENDING MOMENT: Definition of beam, types of beams. Concept of shear force and bending moment. Relation between Shear Force, bending moment and rate of loading at a section of a beam. Shear Force and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads. Determination of point of contra flexure.

UNIT - III

FLEXURAL STRESSES: Theory of simple bending, assumptions. Derivation of bending equation: M/ I = f/y = E/R. Determination of bending stresses, section modulus of rectangular section, circular sections (Solid and Hollow), I, T, angle and channel sections.

SHEAR STRESSES: Derivation of shear stress equation, Determination of shear stress distribution across various beams sections like rectangular, circular, I, T, and angle sections.

UNIT - IV

DEFLECTION OF BEAMS: Differential equation for deflection of beam. Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, uniformly distributed load combination of these loads by using Double integration and Macaulay's methods.

UNIT - V

THIN CYLINDERS: Thin cylindrical shells. Derivation of formula for longitudinal and circumferential stresses. Derivation of change in dimensions of thin cylindrical shells. Thin spherical shells.

THICK CYLINDERS: Derivation of lames equation for thick cylinders shells, compound cylinders. Thick spherical shells.

TEXT BOOKS:

1. Ramamrutham. S (2012), Strength *of materials*, 17th edition, Dhanpat Rai Publications, New Delhi,India.
2. Timoshenko. S (2004), *Strength of materials*, 3rd edition, CBS Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Bhavikathi S. S (2008), *Strength of materials*, 3rd edition, Vikas Publishing House, New Delhi,India.
2. Ryder G. H (2007), *Strength of materials*, 3rd edition, Macmillan, New Delhi,India.
3. Dr. Bansal R. K (2007), Strength of materials, 10th edition, Laxmi Publications, Hyderabad,India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MECHANICS OF FLUIDS

Course Code: A2308

L	T	P	C
4	0	0	4

Course Overview:

This course starts by introducing some basic ideas of application of fluid mechanics in day to day life. The course provides detailed study of fluid properties, fluids types, fluid dynamics, energy and momentum principles and flow measurement. The course of fluid mechanics includes the derivation of continuity, Bernoulli and Euler equations and their applications, boundary layer concepts and study of compressible fluids.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the fundamental aspects of fluid statics, kinematics and dynamics.

CO2. **Compare** types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts.

CO3. **Solve** problems by applying the principles of mass, momentum, and energy conservation.

CO4. **Analyze** flow through Pipes and pipe fittings, Nozzles, Drag and lift on submerged bodies, Propagation of pressure waves.

CO5. **Determine** the specifications of pressure and flow measuring devices, piping, Nozzles and submerged bodies.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MECHANICS OF FLUIDS

Course Code: A2308

L	T	P	C
4	0	0	4

SYLLABUS

UNIT- I

FLUID PROPERTIES AND FLUID STATICS: Density, Mass density, Specific weight, Specific volume, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension, Pascal's law. Hydro static law, Piezometer, simple and differential manometers, pressure gauges, Hydrostatic forces on surfaces, total pressure and center of pressure plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies and submerged bodies.

UNIT - II

FLUID KINEMATICS: Types of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, Compressible and Incompressible flows. One, two and three dimensional flows, Continuity equation in 3D flow. Stream line, path line, streak line, stream tube, stream function, velocity potential function, Free and Forced Vortex.

UNIT - III

FLUID DYNAMICS: Surface and Body forces, Euler's and Bernoulli's equation derivation, Momentum equation and applications.

FLOW MEASUREMENT: Flow through venture meter and orifice meter, pitot tube flow through nozzles, Darcy's equation, Minor losses - pipes in series, pipes in parallel, total energy line and hydraulic gradient line.

UNIT - IV

BOUNDARY LAYER CONCEPTS: Definition, Displacement thickness, Momentum thickness and Energy Thickness, Boundary layer characteristics along thin plate, laminar and turbulent layers, boundary layer in transition flow, separation of boundary layer, drag and lift on submerged bodies.

UNIT - V

FLOW OF COMPRESSIBLE FLUID: Introduction, Thermodynamic relations, basic equations of compressible flow, Velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mach angle, propagation of pressure waves and stagnation properties.

TEXT BOOKS:

1. P.N.Modi,S.M.Seth(2014),*Hydraulicsandfluidmechanicsincludinghydraulicmachines*,20th revised edition Standard Book House, India.
2. Yumus A. Cengel, John M. Cimbala (2010), *Fluid Mechanics (SI Units),* 2nd edition, Tata McGraw Hill education(P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. R. K. Bansal (2011), *A Textbook of Fluid Mechanics and Hydraulic Machines*, 10th edition, Laxmi Publications, New Delhi, India.
2. Frank M. White (2011), *Fluid Mechanics*, 7th edition, Tata McGraw Hill, New Delhi, India.
3. John F. Dauglas (2005), Fluid *Mechanics*, 5th edition, Pearson Education Limited, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

THERMODYNAMICS

Course Code: A2309

L	T	P	C
3	1	0	4

Course Overview:

Thermodynamics is the field of physics that deals with the relationship between heat and work in a substance during different types of thermodynamic processes. Specifically, thermodynamics focuses largely on how a heat transfer is related to various energy changes within a system undergoing a thermodynamic process. Such processes usually result in work being done by the system and are guided by the laws of thermodynamics. The course is extended to study the properties of pure substance and also the analysis of power and refrigeration cycles.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the properties and basic concepts of thermodynamics

CO2. **Develop** the general energy equations by applying laws of thermodynamics and study flow energy equation.

CO3. **Solve** problems by applying the principles of mass, heat and work for closed and control volume systems.

CO4. **Evaluate** and compare the performance of power cycles and refrigeration cycles**.**

CO5. **Determine** the properties of pure substance in various stages using steam tables.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

THERMODYNAMICS

Course Code: A2309

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

BASIC CONCEPTS: Macroscopic and microscopic approaches, thermodynamic systems, boundary, surroundings, thermodynamic property, intensive and extensive properties, concept of continuum, thermodynamic equilibrium, state, path, process and cycle, quasistatic, reversible and irreversible processes, concepts of heat and work, equality of temperature and Zeroth Law of Thermodynamics.

UNIT - II

FIRST LAW OF THERMODYNAMICS: Energy and its forms, Thermodynamic temperature scales, First law of thermodynamics, internal energy, enthalpy, PMM-I, steady flow energy equation, First law applied to non-flow process, steady flow process, throttling process and free expansion process.

UNIT - III

SECOND LAW OF THERMODYNAMICS: Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements of second law, PMM-II, Carnot cycle, Carnot heat engine and Carnot heat pump, Carnot theorem and its corollaries, Entropy, Clausius inequality, principle of entropy increase. Availability, unavailable energy, Helmholtz function, Gibbs function and Maxwell's relations.

UNIT - IV

PURE SUBSTANCE: Properties of pure substance, phase transformation, saturated and superheated steam, solid- liquid-vapour equilibrium, Formation of steam, dryness fraction, properties of dry, wet and superheated steam, Mollier diagram and steam calorimetry. Throttling and free expansion processes.

UNIT - V

POWER CYCLES: Air cycles, Gas cycles and actual cycles, Otto, Diesel and Dual combustion cycles, description and representation on PV and TS diagrams, Thermal efficiency, mean effective pressures on air standard basis, comparison of cycles, introduction to Brayton and Bell Coleman cycle

TEXT BOOKS:

1. P. K. Nag (2008), Engineering Thermodynamics, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. R. K. Rajput (2010), A text book of Engineering Thermodynamics, Fourth Edition, Laxmi Publications, New Delhi, India

REFERENCE BOOKS:

1. J. B. Jones, R. E. Dugan (2009), Engineering Thermodynamics, 1st edition, Prentice Hall of India Learning, New Delhi,India.
2. YunusCengel, Boles (2011), Thermodynamics - An Engineering Approach, 7th edition, Tata McGraw-Hill, New Delhi, India.
3. Y. V. C. Rao (2009), An introduction to Thermodynamics, Revised Edition, Universities Press, Hyderabad, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

METALLURGY & MATERIAL SCIENCE

Course Code: A2310

L	T	P	C
3	1	0	4

Course Overview:

Metallurgy is a domain of materials science and engineering that studies the physical and chemical behavior of metallic elements, their inter metallic compounds, and their mixtures, which are called alloys. Metallurgy is also the technology of metals: the way in which science is applied to the production of metals, and the engineering of metal components for use in products for consumers and manufacturers. The production of metals involves the processing of ores to extract the metal they contain, and the mixture of metals, sometimes with other elements, to produce alloys.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the basic principles of materials.

CO2. **Identify** the phases and interrelationship between structure and properties.

CO3. **Construct** phase diagram of alloy systems.

CO4. **Apply** basic principles for selection of materials.

CO5. **Characterize** materials based on structure.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

METALLURGY & MATERIAL SCIENCE

Course Code: A2310

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

INTRODUCTION: Historical perspective, scope of materials science and engineering. Atomic structure and inter atomic bonding.

STRUCTURE OF METALS: Lattices, basic idea of symmetry. Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number. Imperfections in solids: point defects, line defects, surface defects. Grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size.

CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT - II

EQUILIBRIUM OF DIAGRAMS: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of Fe-Fe3C, equilibrium phase diagram.

UNIT - III

CAST IRONS AND STEELS: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

HEAT TREATMENT OF ALLOYS: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - IV

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

CERAMIC MATERIALS: Crystalline ceramics, glasses, cermaets, abrasive materials, nanomaterials - definition, properties and applications of the above.

UNIT - V

COMPOSITE MATERIALS: Classification of composites, methods of manufacturing of composites, particle - reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal matrix composites and C – C composites.

TEXT BOOKS:

1. V. Raghavan , *Material Science and Engineering: A first course*, 5th edition, Prentice Hall of India (P) Ltd, New Delhi, India.
2. Sidney H. Avener , *Introduction to Physical Metallurgy*, 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. William F. Hosford (2007), Materials Science, an Intermediate Text, Cambridge university press.
2. Dieter, George Ellwood, Mechanical Metallurgy, Copyright © 1988 McGraw-Hill Book Company (UK)Limited.
3. MichaelF.AshbyandDavidR.H.Jones,EngineeringMaterials2, an Introduction to Microstructures, Processing and Design Second Edition, Butterworth-Heinemann.
4. William D. Callister, Jr., Materials science and engineering: an introduction, John Wiley &Sons.
5. R. E. Smallman, R. J. Bishop, Modern Physical Metallurgy and Materials Engineering Science, process, applications, Butterworth-Heinemann
6. S.L. Kakani and Amit Kakani (2004), Materials Science, New Age International (P) Limited, Publishers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MACHINE DRAWING

Course Code: A2311

L	T	P	C
0	0	6	4

Course Overview:

Machine drawing is used to communicate the necessary technical information required for manufacture and assembly of machine components. These drawings follow rules laid down in national and International Organizations for Standards (ISO). Hence the knowledge of the different standards is very essential. Students have to be familiar with industrial drafting practices and thorough understanding of production drawings to make them fit in industries. The following topics have been covered to fulfill the above objectives. Classification of Machine Drawings, Principles of Drawings, Sectioning, Dimensioning, Limits, Fits and Tolerance, Symbols and Conventional Representation, Screw Fasteners, Key Joints, Coupling and its Types, Riveted Joints, Welded Joints, Structural Applications, Assembly Drawings, Production Drawings, Reproduction of Drawing, Introduction of Computer Aided Drafting, Introduction of Solid 3DModeling.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the working principles of the components of steam, gas turbine power plants and different jet propulsion systems.

CO2. **Sketch** various property diagrams and plot the cycle diagrams for steam, gas turbine power plants and jet propulsion systems.

CO3. **Derive** the efficiency, property relations for steam, gas turbine power plants and jet propulsion systems.

CO4. **Solve** problems of steam, gas turbines and different jet propulsion systems.

CO5. **Analyze** the thermodynamic aspects of steam, gas turbines and jet propulsion systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MACHINE DRAWING

Course Code: A2311

L	T	P	C
0	0	6	4

SYLLABUS

I. INTRODUCTION

a) Need for drawing conventions – Introduction to IS conventions

b) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears.

c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes ,centers, curved and tapered features.

d) Title boxes, size, location and details - common abbreviations &liberal usage

e) Types of Drawings – working drawings for machine parts.

II. DRAWING OF MACHINE ELEMENTS AND SIMPLEPARTS

Selection of views, additional views for the following machine elements and parts with every drawing proportion.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, setscrews.

b) Keys, cottered joints and knuckle joint.

c) Rivetted joints for plates

d) Shaft coupling, spigot and socket pipe joint.

e) Journal, pivot and collar and foot step bearings.

III. ASSEMBLYDRAWINGS

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.

b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.

c) Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: Adopt First Angle Projection

TEXT BOOKS:

1. N. Sidheshwar, P.Kannaiah, (2009), *Machine Drawing*, Vol-1, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi,India.
2. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, (2006), *Machine Drawing,* 3rd edition, New Age Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Dhawan,(2008),*MachineDrawing*,*aTextbookofMachineDrawing*,4thedition,S.ChandPublications,New Delhi, India.
2. N. Siddeshwar, P. Kannaiah, V.V.S. Sastry (1999), *Machine Drawing,* 21st edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. A. Singh, (*2003), Machine Drawing*, 5th edition, Tata McGraw Hill education (P) Ltd, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

ENVIRONMENTAL SCIENCE

Course Code: A2011

L	T	P	C
4	0	0	4

Course Overview:

Environmental study is interconnected; interrelated and interdependent subject. Hence, it is multidisciplinary in nature. The present course is framed by expert committee of UGC under the direction of Honorable Supreme Court to be as a core module syllabus for all branches of higher education and to be implemented in all universities over India. The course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. The course description is: multidisciplinary nature of environmental studies, Natural Resources: Renewable and non- renewable resources; Ecosystems; Biodiversity and its conservation; Environmental Pollution; Social Issues and the Environment; pollution control acts. The course is divided into five chapters for convenience of academic teaching.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Identify** the important components of environment

CO2. **Identify** global environmental problems and come out with best possible solutions.

CO3. **Apply** environmental laws for the protection of forest and wildlife.

CO4. **Apply** the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.

CO5. **Illustrate** the major environmental effects of exploiting natural resources.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

ENVIRONMENTAL SCIENCE

Course Code: A2011

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I
ENVIRONMENTAL SCIENCE INTRODUCTION AND NATURAL RESOURCES

INTRODUCTION: Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance. Need for Public Awareness.

NATURAL RESOURCES: Renewable and non-renewable resources. Natural resources and associated problems:

FOREST RESOURCES: Use and over – exploitation, deforestation, Timber extraction, Mining, dams and other effects on forest and tribal people.

WATER RESOURCES: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams– benefits and problems.

MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and using mineral resources.

FOOD RESOURCES: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

ENERGY RESOURCES: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

LAND RESOURCES: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

UNIT- II
ECOSYSTEM AND BIODIVERSITY

ECOSYSTEMS: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem, Forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems.

BIODIVERSITY AND ITS CONSERVATION: Introduction. Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega diversity nation. Hot-sports of biodiversity. Threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity- In-situ and Ex-situ conservation of biodiversity.

UNIT - III
ENVIRONMENTAL POLLUTION, GLOBAL ENVIRONMENTAL ISSUES AND CONTROL MEASURES

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of air pollution, water

pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards.

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

DISASTER MANAGEMENT: Floods, earthquake, cyclone and landslides. E-waste and plastic waste-recycling and reuse.

WATER CONSERVATION: Rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

UNIT- IV
GREEN ENVIRONMENTAL ISSUES

INTRODUCTION: Clean development mechanism, carbon foot printing, carbon credits, carbon sequestration,
Polluter pay principle. Green building practices. Approaches to green computing and nanotechnology. IS014000. Role of information Technology in Environment and human health. Case Studies.

UNIT – V
ENVIRONMENTAL ETHICS, ENVIRONMENTAL IMPACT ASSESMENT & ROLE OF NGOs

ENVIRONMENTAL ETHICS: Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation. Public awareness.

ENVIRONMENTAL IMPACT ASSESSMENT: Conceptual facts of EIA, Baseline date acquisition, planning and management of impact studies, operational aspects of EIA, methods for impact identification, prediction of impacts (air, water, noise, soil, biological and socio-economics). Environmental Management Plan. Role of NGOs in creating awareness among people regarding environmental issues.

TEXT BOOKS:

1. Erach Bharucha (2005), Textbook of Environmental Studies for Undergraduate Courses, Hyderabad, UniversitiesPress.
2. Benny Joseph (2005), Environmental Studies, New Delhi, Tata McGraw Hill Publishing Co.Ltd.

REFERENCE BOOKS:

1. Anubha Kaushik (2006), Perspectives in Environmental Science, 3rd Edition, New Delhi, New age international.
2. Anji Reddy .M (2007), Textbook of Environmental Sciences and Technology, Hyderabad, BS Publications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MOS / MMS LAB

Course Code: A2312

L	T	P	C
0	0	3	2

Course Overview:

Basic properties of the materials are very important for designing any machine component. Principles behind the development and achieving the properties and use them for designing the components is discussed in this course. Application of theories and interpretation of basic data will also be demonstrated. Material selection and correlating them with their physical, mechanical and micro structural aspects will also be covered.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** methods to determine mechanical properties and elastic constants

CO2. **Estimate** compressive strength of wood/concrete/brick materials

CO3. **Determine** slope and deflection of beams

CO4. **Characterize** the microstructures of different ferrous and non-ferrous metals.

CO5. **Identify** the effect of heat treatment and cooling rates on the properties of steels

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

MOS / MMS LAB

Course Code: A2312

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

A. MECHNICS OF SOLIDSLAB:

Mechanical behavior of different material through

1. Tensile test
2. Compression test
3. Shear test
4. Torsion test
5. Impact test
   a. Izod
   b. Charpy
6. Hardness test
   a. Rockwell
   b. Brinell
7. Bending test
   a. Simply supported beam
   b. Cantilever beam

B. METALLURGY MATERIAL SCIENCE LAB:

I. Sample preparation and study of micro structure of

a. Pure metal
   1. Mild steel
   2. Copper
   3. aluminum

b. Alloy materials
   1. Cast iron
   2. Non Ferrous alloys
   3. Heat treated steels

II. Heat treatment of materials

1. Jominy end test
2. Quenching
3. Annealing
4. Normalizing

Minimum 12 of the above experiments are to be conducted.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

FUELS AND LUBRICANTS LAB

Course Code: A2313

L	T	P	C
0	0	3	2

Course Overview:

The primary objective of this laboratory is to determine the properties of several fuels and lubricants compare them with standards so as to get an idea about its quality. Laboratory exercises will include studies of physical properties of various fuels such and viscosity, volatility and calorific value. Particular emphasis will be placed on cloud and pour point, grease penetration and carbon residue. This lab will supplement theoretical inputs in the basic sciences and engineering courses.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Estimate** flash and fire points of a given oil using Pensky Marten's and Abel's Apparatus.

CO2. **Calculate** the viscosity by using Say Bolt Viscometer, Redwood Viscometer-I, Redwood Viscometer-II & Engler viscometer.

CO3. **Determine** grease Penetration value using Standard Penetro meter.

CO4. **Determine** carbon residue value by using Conrad son carbon residue apparatus.

CO5. **Find** out cloud and pour point of lubricant.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R14**

FUELS AND LUBRICANTS LAB

Course Code: A2313

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Determination of Viscosity using Saybolt Viscometer.
2. Determination of Viscosity using Redwood Viscometer-I.
3. Determination of Viscosity using Redwood Viscometer-II.
4. Determination of Viscosity using Engler Viscometer.
5. Determination of Flash and Fire points of Liquid Fuels using Pensky Marten's apparatus.
6. Determination of Flash and Fire points of Liquid Fuels using Abel's apparatus.
7. Grease Penetration Test using Standard Penetro meter.
8. Determination of Calorific Value of solids and liquid fuels using Bomb Calorimeter.
9. Determination of Calorific Value (Gases) using Junker Calorimeter.
10. Carbon Residue Test: Solid/ Liquid Fuels using Conradson carbon residue apparatus.
11. Determination of Viscosity using kinematic viscosity bath apparatus.
12. Determination of cloud and pour point of lubricant.

SYLLABI FOR
IV SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: A2012

L	T	P	C
4	0	0	4

Course Overview:

This course addresses the concepts, principles and techniques of Managerial Economics and Financial Analysis. It covers the fundamentals of Managerial Economics and its various techniques such as demand, elasticity of demand, demand forecasting, production laws, cost concepts, price determination in various type of markets and pricing strategies. Apart from Capital budgeting and its techniques, Financial Analysis gives clear idea about concepts and conventions of accounting, accounting procedures like journal, ledger, trial balance, balance sheet and interpretation of financial statements through ratios.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** and infer the concepts of Managerial Economics and Financial Accounting

CO2. **Analyze** the demand, production, cost and break even to know interrelationship of among variables and their impact

CO3. **Classify** the market structure to decide the fixation of suitable price.

CO4. **Apply** capital budgeting techniques to select best investment opportunity.

CO5. **Prepare** financial statements and analyze them to assess financial health of business

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: A2012

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO MANAGERIAL ECONOMICS: Definition, nature and scope managerial economics. Demand analysis - demand determinants, law of demand and its exceptions.

ELASTICITY OF DEMAND: Definition, types, measurement and significance of elasticity of demand. Demand forecasting, factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)**.**

UNIT - II

THEORY OF PRODUCTION AND COST ANALYSIS: Production function - isoquants and isocosts, MRTS, least cost combination of inputs, production function, laws of returns, internal and external economies of scale.

COST ANALYSIS: Cost concepts, opportunity cost, fixed vs. variable costs, explicit costs vs. implicit costs, out of pocket costs vs. imputed costs. Break Even Analysis (BEA), termination of breakeven point (simple problems), managerial significance and limitations of BEA.

UNIT - III

INTRODUCTION TO MARKETS AND PRICING STRATEGIES: Market structures - types of competition, features of perfect competition, monopoly and monopolistic competition. Price-output determination in case of perfect competition and monopoly. Pricing strategies.

UNIT - IV

BUSINESS AND NEW ECONOMIC ENVIRONMENT: Characteristic features of business, features and evaluation of sole proprietorship, partnership, joint stock company, public enterprises and their types, changing business environment in post-liberalization scenario.

CAPITAL AND CAPITAL BUDGETING: Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals, methods of capital budgeting: payback method, Accounting Rate of Return (ARR) and net present value method (simple problems).

UNIT - V

INTRODUCTION TO FINANCIAL ACCOUNTING: Double entry book keeping, journal, ledger, trial balance-final accounts (trading account, profit and loss account and balance sheet with simple adjustments).

FINANCIAL ANALYSIS THROUGH RATIOS: Computation, analysis and interpretation of liquidity ratios (current ratio and quick ratio), activity ratios (inventory turnover ratio and debtor turnover ratio), capital structure ratios (debt- equity ratio, interest coverage ratio), and profitability ratios (gross profit ratio, net profit ratio, operating ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri (2005), *Managerial Economics and Financial Analysis*, 2nd edition, Tata McGraw Hill, New Delhi.
2. Varshney, Maheswari (2003), *Managerial Economics*, Sultan Chand, New Delhi.

REFERENCE BOOKS:

1. Ambrish Gupta (2004), *Financial Accounting for Management,* Pearson Education, New Delhi.
2. Domnick Salvatore (2003), *Managerial Economics in a Global Economy,* 4th edition, Thomson Publications, India.
3. Narayanaswamy (2005), *Financial Accounting - A Managerial Perspective,* Prentice Hall of India, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

THERMAL ENGINEERING - I

Course Code: A2314

L	T	P	C
3	1	0	4

Course Overview:

This course is intended to introduce basic concepts of internal combustion engines and air compressors. It includes the detailed study of the actual cycles and their analyses, concepts of normal & abnormal combustion in IC engines, Testing and Performance of Engines, and Compressors.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Compare** air standard cycles with actual and fuel air cycles

CO2. **Analyze** combustion phenomenon in spark ignition (SI) and compression ignition (CI) engines.

CO3. **Explain** the performance parameters of internal combustion engines and compressors.

CO4. **Solve** the problems related to IC engines and compressors**.**

CO5. **Evaluate** the performance of internal combustion engines and compressors.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

THERMAL ENGINEERING - I

Course Code: A2314

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

I.C. ENGINES: Classification, Working principles, Valve and Port Timing Diagrams. Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down, Loss due to Gas exchange process, Volumetric Efficiency, Loss due to Friction.

UNIT - II

COMBUSTION IN S.I ENGINES: Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking, Fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types.

COMBUSTION IN C.I. ENGINES: Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT - III

TESTING AND PERFORMANCE: Parameters of performance, Brake power, friction power and indicated power, Mechanical efficiency & Thermal efficiency based of brake power and indicated power, volumetric efficiency, Performance test, Heat balance sheet.

UNIT - IV

COMPRESSORS: Classification, positive displacement and dynamic types, reciprocating and rotary types.

RECIPROCATING: Principle of operation, work required by the compressor, Isothermal efficiency, volumetric efficiency and its effect on clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

UNIT - V

CENTRIFUGAL COMPRESSORS: Mechanical details and principle of operation, velocity and pressure variation. Energy transfer, impeller blade shape and its losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation, velocity triangles and energy transfer per stage, degree of reaction, work done factor, isentropic efficiency, pressure rise calculations, polytrophic efficiency.

TEXT BOOKS:

1. V. Ganesan (2013), *I.C. Engines*, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. B. John Heywood (2011*), Internal combustion engine fundamentals*, 2nd edition, Tata McGraw-Hill, NewDelhi.
3. R. K. Rajput (2013), *Thermal Engineering*, 18th edition, Lakshmi Publications, New Delhi, India.

REFERENCE BOOKS:

1. Mathur, Sharma (2012), *IC Engines,* 3rd edition, Dhanpat Rai & Sons, New Delhi, India.
2. Pulkrabek (2008), *Engineering fundamentals of IC Engines,* 2nd edition, Pearson Education, NewJersey.
3. Rudramoorthy (2003), *Thermal Engineering*, 5th edition, Tata McGraw-Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

MANUFACTURING TECHNOLOGY - I

Course Code: A2315

L	T	P	C
4	0	0	4

Course Overview:

Production Technology - I is an instructional program that prepares individuals on the manufacturing processes like casting, welding, metal working processes like rolling, forging etc., and plastic processing methods. This program also includes instructions on computations related to forces and power requirements in metal working processes.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** various manufacturing operations like casting, welding, metal and plastic processing.

CO2. **Selection** of manufacturing processes of materials to required shapes economically

CO3. **Study** of mechanical aspects like load, power calculations and analysis of metallurgical variation in properties and its reasons.

CO4. **Analyzing** defects and rectification of defects in various processing

CO5. **Application** of knowledge gained through study of different processing details to realize the mechanical components.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

MANUFACTURING TECHNOLOGY - I

Course Code: A2315

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

Introduction to Manufacturing processes, **CASTING:** Steps involved in making a casting, Advantages of casting and its applications, Pattern and Pattern making, Types of patterns, Materials used for patterns, pattern allowances, Principles of Gating system, Gating ratio and design of Gating system, Solidification of casting, Solidification of pure metal and alloys, short and long freezing range alloys, Risers: Types, function and design. Special casting processes 1) Centrifugal 2) Die 3) Investment.

METHODS OF MELTING: Crucible melting and cupola operation, steel making processes.

UNIT - II

WELDING: Classification of welding processes, types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

UNIT - III

INERT GAS WELDING: TIG and MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering and Brazing. Heat affected zones in welding, welding defects, causes and remedies, destructive and non- destructive testing of welds.

CUTTING OF METALS: Oxy Acetylene Gas cutting, water plasma, cutting of ferrous and non-ferrous metals.

UNIT - IV

HOT WORKING AND COLD WORKING: Strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of cold and hot worked parts.

ROLLING: Fundamentals, theory of rolling, types of Rolling mills, Forces in rolling and power requirements. Stamping, forming and other cold working processes: Blanking and piercing, Bending and forming, Drawing and its types, wire drawing and Tube drawing, coining, spinning, Forces and power requirement in the above operations.

FORGING: Principles of forging, Tools and dies, Types of Forging, Smith forging, Drop Forging, Roll forging, Rotary forging, forging defects.

UNIT - V

EXTRUSION OF METALS: Basic extrusion process and its characteristics, Hot extrusion and cold extrusion, Forward extrusion and backward extrusion, Impact extrusion, Hydrostatic extrusion.

PROCESSING OF PLASTICS: Types of Plastics, Properties, applications and their Processing methods and Equipment (blow and injection modeling).

TEXT BOOKS:

1. P. N. Rao (2011), *Manufacturing Technology*, *Vol -1,* 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi.
2. S. Kalpakjin (2005), *Manufacturing Engineering and Technology*, 4th edition, Pearson Education, NewJersey.
3. GhoshandMallik(2014),*ManufacturingScience,2nd edition,*TataMcGraw-Hilleducation(P)Ltd,NewDelhi.

REFERENCE BOOKS:

1. R. K. Jain (2010), *Production Technology*, 16th edition, Khanna publishers, New Delh , India.
2. S. Raghuwanshi (2011), *A course in workshop Technology*, Vol - II, 3rd Edition, Dhanpat Rai & Co, New Delhi, India.
3. Amithab Gosh and Ashok Kumar mallik (2014), *Manufacturing science*, 2nd edition, East-west press (p) Ltd, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

HYDRAULIC MACHINERY AND SYSTEMS

Course Code: A2316

L	T	P	C
4	0	0	4

Course Overview:

Hydraulic Machines deals with the effect of hydrodynamic force on various types of vanes and describes the hydraulic turbines, reciprocating pumps, centrifugal pumps and their performance. It also includes the working of various types of hydraulic systems like Hydraulic accumulator, Hydraulic Intensifier, Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane, hydraulic couplings and torque converters and Air lift pump.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the basic concepts and working of hydraulic turbines, pumps and systems.

CO2. **Classify** the hydraulic turbines and pumps.

CO3. **Solve** problems of Impact of Jet on vanes and jet propulsion of ships using Impulse Momentum Principle.

CO4. **Analyze** the performance of vanes, turbines and pumps

CO5. **Evaluate** the design parameters of hydraulic turbines and pumps.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

HYDRAULIC MACHINERY AND SYSTEMS

Course Code: A2316

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I

IMPACT OF WATER JETS: Introduction, Impulse Momentum Principle and its applications. Hydrodynamic force of jets on stationary and moving flat plate, Inclined and Symmetrical Curved vanes, Series of flat and symmetrical vanes on wheel when Jet striking at centrally. Force of jet on unsymmetrical stationary and moving vane when jet strikes tangentially at one of the tip-velocity triangles at inlet and outlet, Expressions for work done and efficiency. Angular Momentum Principle, Force of jet on radial vane.

UNIT - II

HYDRAULIC TURBINES: Introduction, Overshot and undershot water wheels, Classification of hydraulic turbines, Pelton Wheel, Work done and working proportions, Francis, Kaplan and propeller turbines, Work done and working proportions. Draft tube- Draft tube theory, Efficiency, Types.

UNIT - III

PERFORMANCE OF TURBINES: Unit quantities, Unit head, Unit discharge and Unit power, Performance under specific conditions, Specific Speed and its expression, Performance characteristic curves, Model testing of turbines, Cavitation and its effects, Governing of turbines, Surge tanks, Water hammer.

RECIPROCATING PUMPS: Main components and working of a reciprocating pump, Types of reciprocating pumps, Power required driving the pump, Coefficient of discharge and slip, Indicator diagram, Effect of acceleration head in suction and delivery pipes, Effect of friction, Maximum vacuum pressure. Work saved by air vessels, Rate of flow into and from air vessel.

UNIT - IV

CENTRIFUGAL PUMPS - I: Types Component parts and working, Work done by the impeller, Manometric head, Losses and Efficiencies, Effect of vane angle on manometric efficiency, Effect of finite number of vanes of the impeller on head on efficiency, Minimum starting speed, Loss of head due to reduced or increased flow, diameters of impeller and pipes.

CENTRIFUGAL PUMPS -II: Specific speed and its expression, Model testing of pumps, Pumps in series and parallel, performance of pumps characteristics curves, NPSH, Cavitation, Priming devices, Pump troubles and remedies.

UNIT - V

HYDRAULIC SYSTEMS: Introduction, Working of Hydraulic accumulator, Hydraulic Intensifier, Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane, hydraulic couplings and torque converters, Air lift pump.

TRANSMISSION OF POWER THROUGH PIPES: Condition for maximum power transmission. Gear and Vane pumps, Hydraulic valves.

JET PROPULSION OF SHIPS: Introduction, Inlet orifices/pipes at right angles and parallel to direction of motion of ship, propulsive force, work and efficiency.

TEXT BOOKS:

1. Dr. P. N. Modi, Dr. S. M. Seth (2011), *Hydraulics and Fluid Mechanics including hydraulic machines,* 14th edition, AD. Computers, New Delhi,India.
2. S. P. Ojha, R. Berndtsson (2012), *Fluid Mechanics and Machinery*, Oxford Higher Education, USA.

REFERENCE BOOKS:

1. Dr. R. K. Bansal, (2011*), Fluid Mechanics and Hydraulic machines*, 11th edition, Laxmi publications Private limited, New Delhi, India.
2. Dr. A. K.Jain (2009), *Fluid Mechanics*, 10th edition, Khanna Publishers, New Delhi, India.
3. M. Fank White, (2011*), Fluid Mechanics* (SIE), 7th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

KINEMATICS OF MACHINERY

Course Code: A2317

L	T	P	C
3	1	0	4

Course Overview:

This course deals with the fundamental concepts and principles applied by engineers in the design of structures and to provide in-depth knowledge in basic mechanisms. It builds upon the mathematics and physics courses, extending to learn the systematic way of solving problems and kinematics to understand what happens to a body when force(s) is/are applied to it. It aim also to engage students to understand the different methods of obtaining a mechanism and utilize analytical, mathematical and graphical aspects of kinematics for effective design.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the principles of kinematic pairs, chains and their classification, Degrees of freedom, inversions, and planar mechanisms.

CO2. **Analyze** the planar mechanisms for position, velocity and acceleration.

CO3. **Synthesize** planar four bar and slider crank mechanisms for specified kinematic conditions.

CO4. **Evaluate** gear tooth geometry and select appropriate gears for the required applications.

CO5. **Design** cams and followers for specified motion profiles.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

KINEMATICS OF MACHINERY

Course Code: A2317

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

MECHANISMS: Elements or Links, Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs, sliding, turning, rolling, screw and spherical pairs, lower and higher pairs, closed and open pairs, constrained motion completely, partially or successfully constrained and incompletely constrained.

MACHINES: Mechanism and machines, classification of machines, kinematic chain, inversion of mechanism, inversions of four bar chain, Beam Engine, Coupling rod of a locomotive , Watt's indicator mechanism inversions of single slider crank chain - Pendulum pump , Oscillating cylinder engine, Rotary I.C. Engine , Crank and slotted lever quick return motion mechanism , Whit worth quick return motion mechanism and inversions of double slider crank chain- Elliptical trammel, Scotch yoke mechanism , Oldham's coupling.

UNIT - II

STRAIGHT LINE MOTION MECHANISMS: Exact and approximate copiers and generated types, Peaucellier, Hart and Scott Russul, Grasshopper Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

KINEMATICS: Velocity and acceleration, Motion of link in machine, Determination of Velocity and acceleration diagrams, Graphical method, Application of relative velocity method four bar chain.

UNIT - III

ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, velocity and acceleration of slider, Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration.

PLANE MOTION OF BODY: Instantaneous center of rotation, centroids and axodes, relative motion between two bodies, three centre's in line theorem, Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

STEERING MECHANISMS: Conditions for correct steering, Davis Steering gear, Ackerman's steering gear, velocity ratio.

HOOKE'S JOINT: Single and double Hooke's joint, Universal coupling, application, problems.

UNIT - IV

CAMS& FOLLOWERS: Classification of followers and cams- Definitions- Motions of the follower- Uniform velocity- Simple harmonic motion- Uniform acceleration and retardation- Displacement- Velocity and acceleration diagrams. Construction of cam profiles- Cam with knife edged follower and roller follower- Cams with specified contours- Tangent cam with roller follower- Circular arc cam with flat faced follower.

BELT, ROPE AND CHAIN DRIVES : Introduction, Belt and rope drives, selection of belt drive- types of belt drives-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

UNIT – V

TOOTHED GEARING: Classification of toothed wheels, technical terms, conditions for constant velocity ratio of toothed wheels- Law of gearing- Velocity of sliding of teeth, forms of teeth- Length of contact, arc of contact, interference in involute gears, minimum number of teeth required on pinion to avoid interference- Methods of avoiding interference- Helical gears, Spiral gears- Efficiency of spiral gears.

GEAR TRAINS: Introduction, Train value, Types, Simple and reverted wheel train, Epicyclic gear Train. Methods of finding train value or velocity ratio, Epicyclic gear trains.

TEXT BOOKS:

1. S. S. Rattan(2009), *Theory of Machines and Mechanisms*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. Thomas Bevan (2012), *Theory of machines*, 3rd edition, CBS Publishers, New Delhi, India.
3. V.P. Singh(2012),Theory of machines,3rd edition, Dhanapat Rai & Co, New Delhi, India

REFERENCE BOOKS:

1. R. L. Norton(2011), *Kinematics and dynamics of machinery (SIE),* Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. R. K. Bansal(2010), *Theory of machines*, 5th edition, Lakshmi Publications, Hyderabad, India.
3. R. S. Khurmi, J. K. Gupta (2010), *Theory of machines*, S. Chand Publishers, New Delhi, India.
4. Jagadish lal (2006), Theory of mechanisms and machines, 2nd edition, metropolitan book Co. Pvt. Ltd., New Delhi, India

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

ELECTRICAL TECHNOLOGY

Course Code: A2213

L	T	P	C
4	0	0	4

Course Overview:

The goal of this course is to give a good basic understanding of Electrical machines. The principle of operation and the construction details of various Electrical machines like DC Machines Transformers and AC Machines are studied. The basic mechanisms involved in the operation of various single phase machines are discussed.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits.

CO2. **Apply** the knowledge of basic principles and construction of electrical machines for various applications**.**

CO3. **Analyze** electrical Circuits using Nodal Analysis, Mesh analysis and Network theorems and magnetic circuits.

CO4. **Analyze** the characteristics and performance of electrical machines for a suitable application.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

ELECTRICAL TECHNOLOGY

Course Code: A2213

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO ELECTRICAL CIRCUITS: Concept of Circuit, R-L-C parameters, voltage and current sources, source transformation, voltage -current relationship for passive elements, Kirchhoff's laws, network reduction techniques, series, parallel and compound circuits, mesh analysis and Nodal analysis, star-to-delta or delta-to-star transformation and introduction to AC fundamentals

UNIT-II

NETWORK THEOREMS: Thevenin's, Norton's, Superposition, Reciprocity, Maximum Power Transfer, Tellegen's and Millman's theorems for DC excitations

UNIT - III

MAGNETIC CIRCUITS: Magnetic circuits: faraday's laws of electromagnetic induction, concept of self and mutual inductance

D.C GENERATORS: Principle of operation of DC Machines, EMF equation, types of generators, magnetization and load characteristics of DC generators.

D.C. MOTORS: Types of DC motors, characteristics of DC motors, losses and efficiency, Swinburne's test, speed control of DC shunt motor, flux and armature voltage control methods.

UNIT - IV

TRANSFORMERS: Principle of operation of single phase transformer, types, constructional features, phase diagram on no load and load, equivalent circuit, losses and efficiency of transformer and regulation, OC and SC tests, predetermination of efficiency and regulation.

UNIT - V

THREE PHASE INDUCTION MOTORS: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, slip-torque characteristics, efficiency calculation, starting methods

TEXT BOOKS:

1. Sudhakar, Shyammohan S. Palli (2008), Circuit and Networks, Tata McGraw Hill, New Delhi, India.
2. L. Theraja, A. K. Theraja (2011), A Text book of Electrical Technology (Volume-II), 4th edition, S. Chand Publications, New Delhi, India.

REFERENCE BOOKS:

1. Joseph A. Edminister (2002), Schaums outline of Electrical Circuits, 4thedition, McGraw Hill Publications, India.
2. J. B. Gupta (2006), Theory and Performance of Electrical Machines, S. K. Kataria & Sons, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: A2318

L	T	P	C
0	0	3	2

Course Overview:

This course introduces the measurement of flow rates through pipes using flow measuring devices and their calibration, study of major and minor losses, the impact of jet on vanes, the working and performance characteristics of hydraulic pumps and turbines.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Demonstrate** the working of flow meters and hydraulic machines.

CO2. **Evaluate** the discharge and co-efficient of discharge of flow meters.

CO3. **Assess** the flow rate of water through pipe using Rotameter.

CO4. **Estimate** the major and minor loss of flow through pipes.

CO5. **Determine** the performance parameters of vanes, hydraulic turbines and pumps.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEIV Semester **VCE-R14**

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: A2318

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Calibration of Venturi meter.
2. Calibration of Orifice meter.
3. Determination of friction factor for a given pipeline.
4. Determination of loss of head due to sudden contraction in a pipeline.
5. Study of Impact of jets on Vanes.
6. Calibration of Rotameter.
7. Performance Test on Pelton Wheel Turbine.
8. Performance Test on Francis Turbine.
9. Performance Test on Kaplan Turbine.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

ELECTRICAL TECHNOLOGY LAB

Course Code: A2214

L	T	P	C
0	0	3	2

Course Overview:

The goal of this course is to give a good basic understanding of Network theorems, Diodes ,transistors and Electrical machines. The analysis of various theorems like thevenin, Norton, maximum power transfer theorem will be used to solve the circuits for the calculation of voltage, current to reduce the complexity of the circuit. The different characteristics of electrical machines will be plotted by conducting various tests on them.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** knowledge of circuit fundamental to verify Kirchoff laws and Network Theorems

CO2. **Plot** the characteristics of PN Junction Diode, Half wave and Full wave rectifier

CO3. **Apply** the knowledge of basic principles and construction of DC machines and Transformers for various applications.

CO4. **Analyze** the characteristics and performance of DC Shunt Generator and DC Shunt Motor

CO5. **Test** a single phase Transformer, Induction Motor and a Dc Shunt Motor for suitable application

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R14**

ELECTRICAL TECHNOLOGY LAB

Course Code: A2214

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PART - A: ELECTRICAL CIRCUITS

1. Verifications of KVL and KCL for series and parallel networks
2. Determination of PN junction diode characteristics (forward and reverse bias)
3. Realization of transistors CE characteristics (Input and output)
4. Realization of full wave and half wave rectifier characteristics
5. Verification of Thevenins and Norton's theorems.
6. Verification of Maximum Power Transfer theorem.
7. Verification of Super Position and Reciprocity theorems.

PART - B: ELECTRICAL MACHINES

1. Open circuit characteristics of DC Shunt Generator and determine the Critical Field Resistance.
2. Brake test on DC Shunt motor and draw the characteristics.
3. Predetermination of efficiency of given DC Shunt machine.
4. Speed control of DC shunt Motor.
5. Open circuit and Short Circuit tests on Single Phase Transformer.
6. Load test on single phase Transformer.
7. Brake test on three phase induction motors.

SYLLABI FOR
V SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

DYNAMICS OF MACHINERY

Course Code: A2319

L	T	P	C
3	1	0	4

Course Overview:

This course expands on the mechanical engineering student's background in dynamic analysis and synthesis by providing significant skills and experience in modeling and controlling mechanical systems. The knowledge of this subject is very essential for an engineer in designing the various components and sub systems of a machine. Study of applications of gyroscopes is very helpful to learn the precession and its effect on motion. This course helps to learn the concepts and friction and friction devices like clutches, brakes and dynamometers. The static and dynamic balancing of masses and its effect on machines were covered in this course. The course exposes students on basic principles of vibrations for the analysis and design of machine elements and vibration systems.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Determine** the value of gyroscopic couple and explain the effect of gyro couple on all rotating bodies.

CO2. Apply the laws of friction to determine the power lost in brakes, clutches, and pivots.

CO3. **Minimize** the vibrations developed in engines due to unbalanced masses by balancing the rotating and reciprocating masses.

CO4. **Experiment** and measure the frequency of vibrations in different types of beams by using the concept of Simple Harmonic Motion.

CO5. **Discuss** effectively on dynamics of machinery and work as a team for solving problems on reducing the effect of unwanted effect of forces developed in engines.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

DYNAMICS OF MACHINERY

Course Code: A2319

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

FRICTION: Types of friction, Limiting angle and angle of response, Inclined planes, Screw friction, friction circle, pivot and collar bearings.

UNIT – II

CLUTCHES: Friction clutches, Single Disc or plate clutch, uniform pressure and wear theory, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers, absorption and transmission types. General description and methods of operations.

UNIT – III

TURNING MOMENT DIAGRAM AND FLY WHEELS: Turning moment-Inertia Torque - Connecting rod-angular velocity and acceleration, crank effort and torque diagrams, Fluctuation of energy, Fly wheels and their applications in engines and punching presses.

GOVERNERS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and hartung with auxiliary springs. Sensitiveness, isochronisms and hunting

UNIT – IV

BALANCING: *Balancing* of rotating masses: Single and multiple, single and different planes, Analytical and graphical methods.

BALANCING OF RECIPROCATING MASSES: Primary and Secondary balancing of reciprocating masses. Locomotive balancing - Hammer blow, Swaying couple, variation of tractive efforts.

UNIT – V

VIBRATION: Free and forced Vibration of damped and undamped single degree of freedom systems, transverse vibration, Dunkerly's and Raleigh's method, tensional vibration, two and three rotor systems, whirling of shafts, critical speed of shafts.

TEXT BOOKS:

1. S. S. Ratan (2012), Theory of Machines, 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi,India.
2. Thomas Bevan (2012), Theory of machines, 3rd edition, CBS Publishers, New Delhi,India.
3. Jagadish Lal, J. M. Shah (2009), Theory of Machines, Metropolitan, New Delhi,India.

REFERENCE BOOKS:

1. J. S. Rao, R. V. Dukkipati (2010), Mechanism and Machine Theory, New Age Publishers, New Delhi, India.
2. Shiegly (2011), Theory of Machines, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. Khurmi, R.S. (2011), Theory of machines, S. Chand publishers, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANUFACTURING TECHNOLOGY - II

Course Code: A2320

L	T	P	C
4	0	0	4

Course Overview:

Machine Tools is an instructional program that prepares individuals on the basic structure and importance of lathe, shaper, slotter, planer, drilling, milling and other machine tools, its many varieties, various operations and devices that are used to locate and support work pieces and cutting tools. This program also includes instructions on computations related to machining time, tool life and forces in metal cutting.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the knowledge of cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.

CO2. **Evaluate** the tool life and cutting forces by using Taylor's tool life equation and Merchant circle diagram.

CO3. **Explain** the features, working principles and applications of lathe, shaper, planer, slotter, milling, drilling, grinding and broaching machines.

CO4. **Analyze** the various surface finishing operations like lapping, honing and grinding.

CO5. **Classify** the various jigs, fixtures and clamping devices used in machining.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANUFACTURING TECHNOLOGY - II

Course Code: A2320

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

THEORY OF METAL CUTTING: Introduction: Basic elements of machining, sources of heat in metal cutting, basic definitions: cutting speed, feed and depth of cut, orthogonal and oblique cutting, classification of cutting tools, principal angles of single and multi point tools, tool signature, tool geometry in coordinate system ASA and ORS system, types of chips, chip thickness ratio, and chip breakers.

MECHANICS OF METAL CUTTING: Velocity relationships, force relationship in orthogonal cutting, Merchant's circle diagram, forces on a single point tools in turning, stress and strain in the chip, work done in cutting, popular metal cutting theories, tool life, coolants, machinability – Tool materials.

UNIT - II

Engine lathe – Principle of working, specification of lathe – types of lathe – work holder's tool holders – Box tool, Taper turning, and thread turning – for Lathes and attachments. Turret and capstan lathes – collet chucks –other work holders – tool holding devices. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes.

UNIT- III

Shaping slotting and planing machines – Principles of working – Principal parts – specification classification, operations performed. Kinematic scheme of the shaping slotting and planning machines, machining time calculations.

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines.

UNIT - IV

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine. Deep hole drilling machine.

Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel

UNIT - V

Lapping, honing and broaching machines – comparison to grinding – lapping and honing Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

TEXT BOOKS:

1. R. K. Jain *(*2010), *Production Technology,* 16th edition, Khanna publishers, New Delhi, India.
2. B. S. Raghu Vamshi (*20Y10*), *Workshop Technology*, *Vol - II*, 9th Edition, Dhanpat Rai Publishers, New Delhi, India.
3. G.C. Sen, A. Bhattacharya (2010),*Principlesofmachinetools*,3rdedition,newcentralbookagency(P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. H.M.T. (Hindustan Machine Tools) (1980), *Production Technology*, 2nd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. Dr. R. kesavan, B. Vijaya Ramanath (2012), *Manufacturing Technology - II*, 2nd edition, Laxmi publications, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

THERMAL ENGINEERING - II

Course Code: A2321

L	T	P	C
3	1	0	4

Course Overview:

Thermal Engineering is the applications of thermodynamics. The objective of the course is to introduce the mechanical engineering students an understanding of the performance of Rankine cycle, parameters to improve the performance like reheating, regenerating and also Gas turbines and Rocket engines and their performance. The knowledge of thermal engineering helps us in improving and designing the various thermodynamic systems. The course content is designed in such a way that better performance of Steam turbines, Gas turbines and different Jet & Propulsion units could be achieved by the calculation of different performance parameters.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the working principles of the components of steam, gas turbine power plants and different jet propulsion systems.

CO2. **Sketch** various property diagrams and plot the cycle diagrams for steam, gas turbine power plants and jet propulsion systems

CO3. **Derive** the efficiency, property relations for steam, gas turbine power plants and jet propulsion systems.

CO4. **Solve** problems of steam, gas turbines and different jet propulsion systems.

CO5. **Analyze** the thermodynamic aspects of steam, gas turbines and jet propulsion systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

THERMAL ENGINEERING - II

Course Code: A2321

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

BASIC CONCEPTS: Rankine cycle - Schematic layout, Comparison between Rankine Cycle and Carnot cycle. Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance, Regeneration and reheating.

UNIT – II

BOILERS: Classification, working principles, L.P. and H.P. Boilers, Mountings and Accessories, efficiency and heat balance, Draught, classification, artificial draught, induced and forced draught.

STEAM NOZZLES: Function of nozzle, applications, types, Flow through nozzles, velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, and condition for maximum discharge, criteria to decide nozzle shape.

UNIT – III

STEAM CONDENSERS: Requirements of steam condensing plant, Classification working principle of vacuum efficiency and condenser efficiency, air leakage, sources and its affects, cooling water requirement

STEAM TURBINES: Classification, Impulse turbine; Mechanical details, Velocity diagram, effect of friction, power developed, axial thrust, blade or diagram efficiency, condition for maximum efficiency. De-Laval Turbine - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow.

UNIT – IV

REACTION TURBINE: Mechanical details, principle of operation, thermodynamic analysis of a stage, degree of reaction, velocity diagram, Parson's reaction turbine, condition for maximum efficiency.

GAS TURBINES: Simple gas turbine plant, essential components, ideal and actual cycle, parameters of performance, regeneration, inter cooling and reheating, open and closed cycles, merits and demerits.

UNIT – V

JET PROPULSION: Principle of Operation, Classification, Working Principles with schematic diagrams and representation on T-S diagram , Thrust, Thrust Power and Propulsion Efficiency, Turbo jet engines Schematic Diagram, Thermodynamic Cycle, Performance Evaluation.

ROCKETS: Application, Working Principle, Classification, Propellant Type, Solid and Liquid Propellant Rocket Engines.

TEXT BOOKS:

1. R. K. Rajput (2012), *Thermal Engineering*, 18th edition, Lakshmi Publications, New Delhi, India.
2. Cohen, Rogers, Saravana Muttoo(2011), *Gas Turbines*, 9th edition, Addison Wesley Longman, NewDelhi, India.

REFERENCE BOOKS:

1. Ganesan (2011), *Gas Turbines*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. R. Yadav (2011), *Thermodynamics and Heat Engines*, 7th Edition, Central Book Depot, Allahabad, India.
3. P. Khajuria, S. P. Dubey(2009), *Gas Turbines and Propulsive Systems*, 5th edition, Dhanpat rai Publications, NewDelhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

DESIGN OF MACHINE MEMBERS - I

Course Code: A2322

L	T	P	C
3	1	0	4

Course Overview:

This course deals the Systematic approach to design, standardization, Design and Manufacturing, Engineering Materials, Simple Stresses and Compound Stresses in Machine Elements, Design For Strength, strength of mechanical elements; theories of failure under static and dynamic loading situations; impact loading, Design of Fasteners, Design of joints, Design Of Keys and cotter joints, Shaft, Shaft Couplings, Rivet Joints, Welded Joints.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the fundamental concepts of design for various design elements such as shafts, couplings, rivets, welded and bolted joints.

CO2. **Apply** theories of failure and fatigue failure criteria for the design of mechanical components.

CO3. **Design** of riveted, welded and bolted joints for various loading conditions.

CO4. **Determine** the dimensions of shaft with different geometrical features under various loading conditions.

CO5. **Design** shaft couplings for various operating conditions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

DESIGN OF MACHINE MEMBERS - I

Course Code: A2322

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties - selection- Manufacturing consideration in design- BIS codes of steels

STRESSES IN MACHINE MEMBERS: Simple stresses- Combined stresses-Torsional and bending stresses- impact stresses- stress strain relation- various theories of failure- factor of safety- Design for strength and rigidity- preferred numbers. The concept of stiffness in tension- bending- torsion and combined situations. Static strength design based on fracture toughness

UNIT – II

STRESS CONCENTRATION: Definition- Reason for occurrence- Methods to reduce- Stress concentration factor. Design of stress concentrated members subjected to various loads.

DESIGN FOR VARIABLE LOADING: Types of variable/Cyclic loads Mean & amplitude Stresses- Fatigue Failure- Endurance Limit & Strength- S-N Diagram. Goodman and Soderberg criterion- Modifying factors- Problems on design of members for finite & infinite life in members subjected to individual & combined loading.

UNIT – III

RIVETED JOINTS: Introduction –types-Modes of failures of riveted joints-efficiency-Design of joints with initial stresses.

WELDED JOINTS: Introduction-types-strength –unsymmetrical section load axially.

UNIT – IV

BOLTED JOINTS: Design of bolts with pre-stresses, Design of joints under eccentric loading, locking devices, both of uniform strength, different seals

KEYS- COTTERS AND KNUCKLE JOINTS: Design of Keys-stresses in keys spigot and socket-sleeve and cotter- jib cotter joints-Knuckle joint.

UNIT – V

SHAFTS: Design of solid and hollow shafts for strength and rigidity- Design of shafts for combined bending and axial loads-Shaft sizes - BIS codes.

SHAFT COUPLING: Rigid couplings: Muff- Split muff and Flange couplings-Flexible coupling-Bushed pin Flexible coupling.

TEXT BOOKS:

1. V. Bandari (2011)- *A Text Book of Design of Machine Elements*- 3rd edition- Tata McGraw-Hill education(P) Ltd-New Delhi- India.
2. R. L. Norton (2006)- *Machine Design (An Integrated approach*)- 2nd edition- Pearson Publishers- Chennai-India.

REFERENCE BOOKS:

1. Shigley- J. E (2011*)- Mechanical Engineering Design*- 9th edition- Tata McGraw-Hill-India.
2. S. M. D. Jalaludin (2011)- *Machine Design*- 3rd edition- Anuradha Publishers- Chennai-India.
3. P. Kannaiah(2012)-*Machine Design*- 2ndedition-ScitechPublicationsIndiaPvt.Ltd-NewDelhi-India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

METROLOGY AND INSTRUMENTATION ENGINEERING

Course Code: A2323

L	T	P	C
4	0	0	4

Course Overview:

To provide a basic understanding of the range of activities encompassed by personnel working in standards and calibration laboratories. It covers the measurement process, types and correct use of measurement and test equipment, and measurement standards. It provides an opportunity for students to learn about measurement and the procedures necessary to set up and to have knowledge on calibration.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand t**he basic terms related to limits fits, tolerances, Indian and British standards that are used to designate a hole and shaft assembly and the various alignment tests that are conducted on lathe, milling and drilling machine

CO2. **Choose** appropriate method and instruments for inspection of various gear elements and thread elements.

CO3. **Design** the different types of gauges according to standard Indian metrology

CO4. **Compare** the working principle, advantages and limitations of various surface roughness measurement instruments, comparators, linear measuring and angular measuring instruments

CO5. **Measure** the parameters with various gauges and instruments.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

METROLOGY AND INSTRUMENTATION ENGINEERING

Course Code: A2323

L	T	P	C
4	0	0	4

SYLLABUS

UNIT-I

Limits and Fits, ISO system: Fits and types of tolerance interchangeability, Taylor's Principle of plain limit gauges, Use of Plug, Ring and Snap gauges. Indicating type limit gauges. Introduction- Linear and Angular measurements - Slip gauges and End bars - Gauge material and design of gauges, Different types of Micrometers, Height gauges, Sine bar, Auto collimator.

UNIT-II

Comparators: Dial indicator, Sigma and Mechanical comparator, Free flow and Back pressure type Pneumatic comparator. Application of optical projector, Tool maker's Microscope applications, Measurement of Straightness and- Flatness measuring by optical flats.

UNIT-III

Surface Roughness Measurements –parameters as per ISI symbols for indication of surface finish. Profilometer, Taylor Hobson Talysurf. Application of Thread metrology - 2 wire and 3 Wire methods, Gear measurement - Gear tooth thickness, Parkinson gear tester, General geometric tests for testing machine tools-Lathe, drill, mill.

UNIT-IV

Elements of instrumentation system. Static and Dynamic characteristics. Types of errors. Displacement transducers. LVDT. Strain measurement - Wire and foil type resistance strain gauges. Rosette Gauges. Bonding procedure. Measurement of speed mechanical Tachometer, Electrical, strobe scope, contact type of Tachometer

UNIT-V

Introduction to Seismic Transducers - displacement and acceleration measurement, Pressure measurement

- Bourdon pressure gauge, bulk modulus gauge, pirani gauge and RTD Temperature measurement by thermo couples, Laws of thermo electricity, Types of materials used in thermocouples.

TEXT BOOKS:

1. Er. R.K. Jain, (1998), *Mechanical and Industrial Measurements*, Eleventh Edition, Khanna Publishers, New Delhi
2. D.S Kumar, (2001), *Mechanical Measurements and Controls*, Fourth Edition, Metropolitan Book Co. Pvt Ltd., New Delhi

REFERENCE BOOKS:

1. K.L.Narayana(2010),*EngineeringMetrology*,2nd edition,Scitechpublishers,Hyderabad,India.
2. ManoharMahajan(2011),*ATextBookofMetrology*,1stedition,DhanpathRai,NewDelhi,India.
3. A.K. Tayal, (2004), Instrumentation & mech. Measurements, Second Edition, Galgotia Publications, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANAGEMENT SCIENCE

Course Code: A2013

L	T	P	C
4	0	0	4

Course Overview:

Management science deals with nature, Importance of management and their functions, and different types of organizations, **P**lant location, Factors influencing location, Methods of production, Work study, Statistical quality control, Materials management purchase procedure, stores records, EOQ, ABC analysis, HRM, man power planning Recruitment , Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfer, Performance appraisal, job evaluation and merit rating. Techniques in Project management, network analysis, Project cost analysis, projectcrashing.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the concepts & principles of management in industry.

CO2. **Design** & develop organization structure for an enterprise.

CO3. **Apply** Quality Control techniques and Work-study principles in industry.

CO4. **Handle** purchase process and can determine Economic Order Quantity.

CO5. **Apply** the concepts of HRM in Recruitment, Selection and Training & Development.

CO6. **Develop** PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANAGEMENT SCIENCE

Course Code: A2013

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I

INTRODUCTION: Management - Definition, Nature, Importance of management Functions of Management - Taylor's scientific management theory, Fayol's principles of management, Contribution of Elton mayo, Maslow, Herzberg, Douglas MC Gregor, Basic concepts of Organisation- Authority, Responsibility, Delegation of Authority, Span of control, Departmentation and Decentralization - Organisation structures (Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization)

UNIT II

OPERATIONS MANAGEMENT: Plant location, Factors influencing location, Principles and types of plant layouts - Methods of production (job, batch and mass production), Work study - Basic procedure involved in method study and work measurement.

UNIT III

QUALITY CONTROL AND MATERIALS MANAGEMENT: Statistical quality control – Meaning- Variables and attributes - X chart, R Chart, C Chart, P Chart, (simple Problems) Acceptance sampling, Sampling plans, Deming's contribution to quality. Materials management – objectives, Need for inventory control, Purchase procedure, Store records, EOQ, ABC analysis, Stock levels.

UNIT IV

HUMAN RESOURCE MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager: Man power planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfers Separation, performance appraisal, Job evaluation and Merit rating.

UNIT V

PROJECT MANAGEMENT: Early techniques in project management - Network analysis: Programme evaluation and review technique (PERT), Critical path method (CPM), Identifying critical path, Probability of completing project within given time, Project cost analysis, project crashing (simple problems)

TEXT BOOKS:

1. Dr. A.R. Aryasri, Management Science, TMH, 4th edition, 2009

REFERENCES:

1. Koontz & weihrich – Essentials of management, TMH, 8th edition,2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi,2004
3. O.P. Khana, Industrial engineering and Management, L. S. Srinath, PERT &CPM.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

THERMAL ENGINEERING LAB

Course Code: A2324

L	T	P	C
0	0	3	2

Course Overview:

This course is designed for comprehensive study of combustion and thermal aspects in internal combustion engines, steam power plants and its allied components. This will enable the students to understand combustion phenomenon and thermal analysis of steam power plant components. The students will be able to identify, track and solve various combustion problems and evaluate theoretically the performance of various components involved in steam power plants and internal combustion engines.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Compare** the performance of spark ignition and compression ignition engines.

CO2. **Determine** the performance parameters of internal combustion engines and compressors.

CO3. **Analyze** an engine under different loading conditions to calculate brake power, indicated power, friction power and efficiencies.

CO4. **Find** the properties of different fuels and lubricants.

CO5. **Draw** the valve and port timing diagrams of two stroke and four stroke engines

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

THERMAL ENGINEERING LAB

Course Code: A2324

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. To conduct the Performance Test on Single Cylinder 4 Stroke Diesel Engine.
2. To conduct the Motoring Test on Single Cylinder 4-Stroke Diesel Engine.
3. To conduct the Heat Balance test on single cylinder 4 – Stroke Diesel Engine.
4. To conduct the Performance Test on Single Cylinder 2 Stroke Petrol Engine.
5. To conduct the Performance Test on Four Stroke Single Cylinder Variable Compressor Ratio (VCR) Petrol Engine.
6. To conduct the Performance Test on Multi Cylinder 4 Stroke Petrol Engine.
7. To conduct the Performance Test on 2 Stroke Twin Cylinder Reciprocating Air Compressor.
8. To determine the flash point & fire point of a fuel.
9. To determine the Viscosity of a given lubricant oil using Red Wood Viscometer.
10. To Study the different types of fire tube and water tube boilers.
11. To draw Valve Timing Diagram for 4-stroke petrol diesel.
12. To draw port timing diagram for 2-stroke petrol diesel.

Note: Minimum 12 of the above experiments are to be conducted.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANUFACTURING TECHNOLOGY LAB

Course Code: A2325

L	T	P	C
0	0	3	2

Course Overview:

The lab sessions are intended to make the students understand the different operations in machines such as Lathe, Drilling Machine, Milling Machine, Grinding Machine etc. The student will be provided with a raw metal piece along with the dimensions of the required work piece.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Determine** mould sand properties.

CO2. **Demonstrate** the working principle and parts of different machine tools used in machine shop.

CO3. **Apply** various casting and welding techniques.

CO4. **Perform** different sheet metal operations.

CO5. **Prepare** a component using plastic processing technique.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R14**

MANUFACTURING TECHNOLOGY LAB

Course Code: A2325

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability.
3. Moulding Melting and Casting - 1Exercise.
4. ARC Welding Lap & Butt Joint - 2Exercises.
5. Spot Welding - 1Exercise.
6. TIG Welding - 1Exercise.
7. Plasma welding and Brazing - 2Exercises.
8. Blanking & Piercing, bending operations and study of simple, compound and progressive press tool.
9. Injection Moulding & Blow Moulding.
10. Facing, Step turning, and taper turning on lathe machine.
11. Thread cutting and knurling on -lathe machine.
12. Drilling and Tapping.
13. Shaping.
14. Slotting.
15. Milling.
16. Cylindrical and Surface Grinding.
17. Grinding of Tool angles.

Note: Minimum 12 of the above experiments are to be conducted.

SYLLABI FOR
VI SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

PROBABILITY AND STATISTICS

Course Code: A2014

L	T	P	C
3	1	0	4

Course Overview:

This course is a study of probability theory and numerical techniques used to model engineering systems. Topics in probability include: basic axioms of probability, Baye's Theorem, random variables, discrete and continuous probability distributions. It involves the development of mathematical models and the application of the computer to solve engineering problems using the following computational techniques: root-finding using bracketing and open methods, Interpolation, numerical differentiation, numerical integration, linear and polynomial curve fitting and the solution of differential equations using single step methods and multi-step methods.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** basic concepts of probability and statistics and apply them in solving practical engineering problems

CO2. **Apply** discrete and continuous probability distributions to evaluate the probability of real world problems

CO3. **Conduct** hypotheses tests concerning population parameters for single and multiple populations based on sample data.

CO4. **Construct** confidence interval estimates for population parameters.

CO5. **Demonstrate** the knowledge and understand various queuing models

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

PROBABILITY AND STATISTICS

Course Code: A2014

L	T	P	C
3	1	0	4

SYLLABUS

UNIT-I

PROBABILITY: Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Baye's Theorem and Independence, Problems.

UNIT-II

DISTRIBUTION: Discrete and Continuous distributions, Binomial, Poisson distribution, Uniform and Normal distribution, related properties. Sampling Distributions: The Central Limit Theorem, distributions of the sample mean and sample variance for the normal population, Sampling distributions of mean (Known and unknown)

UNIT-III

ESTIMATION: Unbiasedness, consistency, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.

TESTING OF HYPOTHESIS I: Null hypothesis, alternative hypothesis critical region acceptance region, Type=I and Type-II errors, power of the test, Large sample test-Confidential intervals and Testing of hypothesis for single mean, difference of means- Single Proportion and Difference of Proportions.

UNIT-IV

TESTING OF HYPOTHESIS II: Small sample test- Confidence intervals and t-test for single mean, difference of means, F-Distribution, Chi-Square test for goodness of fit and Independence of attributes- its applications, problems.

UNIT-V

QUEUING THEORY: Introduction, Finite queue, infinite queue, Poisson process, Exponential process, Pure Birth Process, Pure Death Process, problems on M/M/1 Model and M/M/∞ Model.

TEXT BOOKS:

1. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), *Probability and Statistics*, 3rd Revised Edition, New Delhi, S. Chand & Company Limited.

REFERENCEBOOKS:

1. Miller, john E. Fruend(2009), Probability and Statistics for Engineers, Prentice Hall of India, New Delhi, India.
2. J.S. Milton, J.C. Arnold (1986) Introduction to probability and Statistics in the engineering and computing Sciences, McGraw-Hill Companies Limited, New Delhi.
3. Harold J. Larson (1982), Introduction to Probability Theory and statistical Inference, 3rd edition, John Wiley & Sons, New York.
4. D.K. Murugeson, P. Guru Swamy (2010), Probability and Statistics, Anuradha Publishers, Chennai, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

NON CONVENTIONAL ENERGY SOURCES

Course Code: A2326

L	T	P	C
3	1	0	4

Course Overview:

The objective of Unconventional Machining is to lead the students to completely understand the unconventional machining processes. Therefore the course starting from the classification of unconventional machining processes based on the elementary mechanism and the machinability of materials with different unconventional processes, presents for each process the basic principles, the most relevant industrial solutions, and the main applications. The relevance of imposed tolerances on costs and production time and the modeling of unconventional machining processes are also taken into consideration.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Identify** the various renewable energy sources, Solar energy collectors and environmental effect.

CO2. **Classify** various methods to store the non conventional sources of energy**.**

CO3. **Compare** with conventional and non conventional energy sources, conversion techniques.

CO4. **Explain** the working principal of various non conventional energy systems and its limitations

CO5. **Analyze** energy conversion resource by considering thermodynamic aspects.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

NON CONVENTIONAL ENERGY SOURCES

Course Code: A2326

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT – III

BIO MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India

UNIT – IV

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT - V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, see beck, peltier and joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. G. D. Rai (2010), Non-Conventional Energy Sources, 2nd edition, Pearson, India.
2. R. Halmshaw (1991), *Non-Destructive Testing*, 2nd edition, Edward Arnold, America.

REFERENCES:

1. B. H. Khan (2012), Non-Conventional Energy Resources, 2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, India.
2. S. Hasan Saeed, D. K. Sharma (2010), Non-Conventional Energy Resources, 1st edition, S. K. Kataria & Sons Publishers, India

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

DESIGN OF MACHINE MEMBERS - II

Course Code: A2327

L	T	P	C
3	1	0	4

Course Overview:

The design of machine members-II focusing mainly on design of gears, bearings, connecting rod, crankpin, crankshafts, pistons, cylinders, Spur, Helical, Bevel, Worm gears, power screws, mechanical springs. It analysis the strength and stiffness of the parts and suitable material for making of different machine elements.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Illustrate** different types of bearings, IC engine parts and power transmission elements related terminology.

CO2. **Select** the bearings for different operating conditions.

CO3. **Design** basic IC engine parts used in power transmission.

CO4. **Determine** the design parameters of gears and power screws.

CO5. **Analyze** helical compression and helical torsion springs with respect to loading.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

DESIGN OF MACHINE MEMBERS - II

Course Code: A2327

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

BEARINGS:

Sliding Contact Bearing: Types of Journal bearings, basic modes of Lubrication, Bearing construction, bearing design, bearing materials, Selection of lubricants.

Rolling Contact Bearings: Types of rolling contact bearings, selection of bearing types, selection of bearing life, Design for cyclic loads and speeds, Static and dynamic loading of ball and roller bearings.

UNIT – II

DESIGN OF IC ENGINE PARTS: Design and proportions of: Cylinder-Cylinder Liners- Pistons- forces acting on piston - thrust in connecting rod- stress due to whipping action on connecting rod ends-Cranks and Crank shafts- strength and proportions of over hung cranks.

UNIT – III

SPUR GEAR DRIVES: Spur gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of spur gears, Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

HELICAL GEAR DRIVES: Helical gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of helical gears, Estimation of centre distance, module and face width, check for plastic deformation. Check for dynamic and wear considerations.

UNIT – IV

DESIGN OF BEVEL GEAR: Bevel gears, classification of Bevel Gears, Terms used in Bevel Gears, Determination of pitch angle for Bevel Gears, Proportions for Bevel Gears, Formative or Equivalent number of teeth for Bevel Gears, Strength of Bevel Gears, Forces acting on a Bevel Gear, Design of a shaft for Bevel Gears.

DESIGN OF WORM GEARS: Worm gears, properties of worm gears, Selection of materials, strength and wear rating of worm gears , Force analysis , Friction in worm gears , Thermal considerations

UNIT – V

DESIGN OF POWER SCREWS: Design of screw- Square- ACME- Buttress screws- design of nut- compound screw- differential screw- ball screw- possible failures.

MECHANICAL SPRINGS: Stresses and deflections of helical springs-Extension-compression springs-Springs for fatigue loading- natural frequency of helical springs - Energy storage capacity -helical torsion springs.

TEXT BOOKS:

1. V. Bandari (2011)- *A Text Book of Design of Machine Elements*- 3rd edition- Tata McGraw-Hill education (P) Ltd-New Delhi-India.
2. R. L. Norton (2006)- *Machine Design (An Integrated approach*)- 2nd edition- Pearson Publishers-Chennai-India.

REFERENCE BOOKS:

1. Shigley- J. E (2011*)- Mechanical Engineering Design*- 9th edition- Tata McGraw-Hill-India.
2. S. M. D. Jalaludin (2011)- *Machine Design*- 3rd edition- Anuradha Publishers- Chennai-India.
3. P. Kannaiah (2012)- *Machine Design*- 2nd edition- Scitech Publications India Pvt. Ltd- New Delhi- India.

DATA BOOKS PERMITTED:

1. S. M. D. Jalaludin (2014)- *Design Data Hand Book-2nd*edition- Anuradha Publishers- Kumbakonam-Chennai-India.
2. K. Mahadevan -K.Balaveera Reddy (2013)- *Design Data Hand Book- 4th edition* -CBS Publishers-NewDelhi-India

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

HEAT TRANSFER

Course Code: A2328

L	T	P	C
4	0	0	4

Course Overview:

The course presents the three modes of heat transfer: conduction, convection, and radiation. One-dimensional steady and transient conduction is studied for planar, cylindrical, and spherical geometries. The lumped capacitance analysis is used for transient conduction when appropriate. Convection heat transfer is studied in both internal and external geometries and under laminar and turbulent flow regimes. External flows include cooling on flat plates due to laminar and turbulent boundary layer flows, and cooling of cylinders due to cross flow. The convection heat transfer analysis in internal flows considers laminar and turbulent pipe flows. Free convection is also considered where heat transfer is due to flow induced by fluid buoyancy. Radiation heat transfer is studied by considering both the general characteristics of radiation as well as the properties of radiating surfaces and radiation heat transfer between surfaces.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Demonstrate** the principles of heat transfer to thermal systems.

CO2. **Analyze** conduction heat transfer phenomenon for steady and transient processes.

CO3. **Determine** correlations in connection with the heat transfer for convection, boiling and condensation

CO4. **Formulate** the heat transfer process in heat exchangers for parallel and counter flow arrangement

CO5. **Evaluate** the parameters of radiative heat exchange process between surfaces.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

HEAT TRANSFER

Course Code: A2328

L	T	P	C
4	0	0	4

SYLLABUS

UNIT –I

INTRODUCTION: Modes and mechanisms of heat transfer, Basic laws of heat transfer –Applications of heat transfer.

CONDUCTION HEAT TRANSFER: General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. Different forms of general equation – Steady state and Transient heat transfer – Initial and boundary conditions. One dimensional steady state heat conduction through Homogeneous slabs, hollow cylinders and spheres, Overall heat transfer coefficient, Electrical analogy, Critical radius of insulation.

UNIT – II

ONE DIMENSIONAL, STEADY STATE HEAT CONDUCTION: Systems with variable thermal conductivity and Systems with internal heat generation. Extended surfaces (Fins) – Long, Short and insulated tips.

ONE DIMENSIONAL, TRANSIENT HEAT CONDUCTION: Systems with negligible internal resistance, Significance of Biot and Fourier Numbers, Chart solutions of transient conduction systems

UNIT – III

CONVECTIVE HEAT TRANSFER: Concepts of Continuity, Momentum and Energy Equations. Dimensional analysis-Buckingham's Pi Theorem - Application for developing non-dimensional correlation for convective heat transfer.

FORCED CONVECTION: External Flows **–** Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for Flat plates and Cylinders. Internal Flows **–** Concepts about Hydrodynamic and Thermal Entry Lengths, use of empirical correlations for Horizontal Pipe Flow and annulus flow.

FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and pipes.

UNIT IV

BOILING AND CONDENSATION: Regimes of Pool boiling and Flow boiling, Critical heat flux, Calculations on Nucleate Boiling. Film wise and drop wise condensation – Nusselt's theory of condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT V

RADIATION HEAT TRANSFER: Emission characteristics – Laws of black-body radiation – Irradiation – Total and monochromatic quantities – Laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann – Heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. YUNUS A CENGEL, (2010), *Heat Transfer A Practical Approach*, TMH, New York
2. Incropera & Dewitt, (2007), *Fundamentals of Heat Transfer*, Sixth Edition, John Wiley, U.K.

REFERENCE BOOKS:

1. P. S. Ghoshdastidar (2007) *Heat Transfer*, Oxford University Press, New Delhi
2. HOLMAN, (2008), *Heat Transfer*, TMH, New York
3. R.C. Sachdeva, (2008), *Fundamentals of Engineering, Heat & Mass Transfer*, Third Edition, New Age, New Delhi
4. D.S. Kumar, (2009), *Heat & Man Transfer*, Sixth Edition, S.K. Kataria & Sons, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

FINITE ELEMENT METHODS

Course Code: A2329

L	T	P	C
3	1	0	4

Course Overview:

The course covers lessons in Finite Element Methods, Concept of a functional Stiffness matrix, Rayleigh–Ritz method, stress-strain relations, strain-displacement relations, shape functions, one dimensional problem, analysis of trusses, analysis of beams, 2-D problems, numerical integration, axisymmetric, heat transfer analysis and dynamic analysis.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Choose** the type of analysis to solve the given problem.

CO2. **Develop** shape functions for 1D, 2D and 3D elements.

CO3. **Model** the given physical problem to mathematical form.

CO4. **Analyze** deformation of elements as per boundary and loading conditions.

CO5. **Determine** the stresses, strains and reaction forces in the element applying finite element methods.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

FINITE ELEMENT METHODS

Course Code: A2329

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

INTRODUCTION TO FEM: Basic concept, historical background, application of FEM, general description, comparison of FEM with other methods. Basic equations of elasticity, Stress, strain relations, Strain, Displacement relations.

ONE DIMENSIONAL PROBLEM: Finite element modeling coordinates and shape functions. Potential Energy approach: Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

ANALYSIS OF TRUSSES: Stiffness Matrix for plane truss and space truss elements, stress calculations. **ANALYSIS OF BEAMS:** Hermite shape functions-Element stiffness matrix for two nodes, two degrees of freedom per node beam element, load vector, deflection, stresses.

UNIT – III

PROBLEMS: CST-Stiffness matrix and load vector, Isoparametric element representation, Shape functions, convergence requirements, Problems.

FINITE ELEMENT MODELLING: Axisymmetric solids subjected to Axisymmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

UNIT – IV

STEADY STATE HEAT TRANSFER ANALYSIS: 1-D analysis of a fin and 2-D analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V

DYNAMIC ANALYSIS: Formulation of finite element model, element matrices, Lumped and consistent mass matrices evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

TEXT BOOKS:

1. R. Tirupathi Chandrapatla (2011), *Introduction to Finite Elements in Engineering*, 4rd edition, Pearson Education, India.
2. S. S. Rao (2012), *The Finite Element Methods in Engineering*, 5th edition, Elsevier, USA.
3. V. David. Hutton (2010), *Fundamentals of finite elements analysis*, 1st edition, Tata McGraw- Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Chennakesava R. Alavala (2009), *Finite elements methods*, 1st edition, second reprint, Prentice Hall of publishers, New Delhi, India.
2. J. N. Reddy (2010), *An introduction to Finite Element Method*, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith, Ted G. Byrom (2009), *The Finite Element Method for Engineers*, 3rd edition, John Wiley & sons (ASIA) Pvt. Ltd., New York.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

NEURAL NETWORK AND FUZZY LOGIC

(Inter departmental Elective - I)

Course Code: A2235

L	T	P	C
4	-	-	4

Course Overview:

This course will introduce the basic principles in artificial intelligence and neural networks research. It will cover simple representation schemes, problem-solving paradigms, constraint propagation, and search strategies and also covers the basic neural network architectures and learning as well as reasoning algorithms for applications in pattern recognition, image processing, and computer vision. The students will have a chance to try out several of these models on practical problems and develop expert systems.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Develop** different architectures of Artificial Neural Networks, learning laws and the learning rules associated with the neural networks

CO2. **Enlighten** the problem of linearly separable using Perceptron model and relate to the concept of Madaline networks

CO3. **Probe** the error associated with the neural network and adjust the weights in Neural Network using Back Propagation technique

CO4. **Explore** the associative learning of the neural network, the architecture of Hopfield network and the error performance of Hopfield network

CO5. **Acquaint** with the difference between Fuzzy sets and Crisp sets and their logics and elucidate the applications of Fuzzy logic Controller

CO6. **Compute** the operations in Fuzzy Relational data Models and expound the design theory for Fuzzy Relational databases

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

NEURAL NETWORK AND FUZZY LOGIC

(Interdepartmental Elective - I)

Course Code: A2235

L	T	P	C
4	-	-	4

SYLLABUS

UNIT–I:

INTRODUCTION TONEURALNETWORKS (Lectures12)

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Applications of ANN.

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT–II:

FEED FORWARDNEURALNETWORKS (Lectures12)

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm,

UNIT-III:

ASSOCIATIVEMEMORIES: (Lectures10)

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, Bidirectional Associative Memory (BAM) Architecture. Architecture of Hopfield Network: Discrete and Continuous versions,

UNIT – IV:

CLASSICAL &FUZZY SETS (Lectures 10)

Introduction to classical sets – properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V:

FUZZY LOGICSYSTEMCOMPONENTS (Lectures10)

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

APPLICATIONS: Neural network applications: control, fault diagnosis and load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOKS:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 – S. N. Sivanandam, S. Sumathi, S. N. Deepa,TMH,

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins, Pearson Education
3. Neural Engineering by C. Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

AIR POLLUTION AND CONTROL METHODOLOGIES

(Inter departmental Elective - I)

Course Code: A2154

L	T	P	C
4	-	-	4

Course Overview:

Air pollution is defined as the presence in the outdoor atmosphere (ambient air) of one or more contaminants in such quantities and for such duration as to be harmful or injurious to human health or welfare, animal or plant life, or property, or may unreasonably interfere with the enjoyment of life or property. It is useful to study the causes and sources of the various air pollutants, as well as their physical and chemical characteristics and these are discussed. There are many different air pollutants, all with differing physical and chemical characteristics, as well as a vast number and variety of air pollution sources.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **List** the main air pollutants and their effects on human health, welfare and the environment.

CO2. **Solve** simple problems related to dispersion and air quality modeling.

CO3. **Choose** methods for control, and prevention of air pollution to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety.

CO4. **Distinguish** between various methods of air pollution analysis.

CO5. **Interpret** meteorological data for atmospheric stability and air pollutant transport and dispersion.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

AIR POLLUTION AND CONTROL METHODOLOGIES

(Inter departmental Elective - I)

Course Code: A2154

L	T	P	C
4	-	-	4

SYLLABUS

UNIT-I

AIR POLLUTION: Definitions, scope, significance, air pollutants classification - natural and artificial, primary and secondary, point and non- point, line and areal, stationary and mobile sources. Effects of air pollutants on man, material and vegetation, global effects of air pollution, greenhouse effect, heat islands, acid rains, ozone holes etc.

UNIT-II

THERMODYNAMICS AND KINETICS OF AIR - POLLUTION: Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion. Meteorology and plume Dispersion,

UNIT-III

PROPERTIES OF ATMOSPHERE: Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

LAPSE RATES: Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT-IV

CONTROL OF PARTICULATES: Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators. General Methods of Control of NOx and Sox emissions, In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

UNIT -V

AIR QUALITY MANAGEMENT: Monitoring of SPM, SO; NO and CO Emission Standards.

TEXT BOOKS:

1. M. N. Rao, H. V. N. Rao (1988), *Air pollution*, Tata McGraw Hill Education, New Delhi, India.
2. C. S. Rao (2006), *Environmental Pollution Control Engineering*, New age international, New Delhi, India.

REFERENCE BOOKS:

1. R. K. Trivedy, P.K. Goel (2003), *Introduction to Air pollution*, ABD Publications, New Delhi, India. Wark, Warner (1998), *Air pollution its origin and control,* Addison-Wesley, New York.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

INDUSTRIAL WASTE AND WASTE MANAGEMENT
(Inter departmental Elective - I)

Course Code: A2148

L	T	P	C
4	-	-	4

Course Overview:

To protect the environment pollution should be prevented and controlled". With Industrialization the pollution has enormously increased. Different ways – Solid, Liquid and Gaseous are generated.

This course incorporates the Management of Industrial Wastes viz. Liquid wastes. The Industrial processes and the sources of their wastes are discussed. Treatment and proper disposal of Industrial waste water have been discussed.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Predict** quality requirements of water in various industries and basic theories of industrial waste water management.

CO2. **Identify** problems of industrial waste water discharges into environment and water.

CO3. **Explain** manufacturing process and origin of liquid waste from different industries and inspect special characteristics, effects and treatment methods.

CO4. **Examine** advantages, suitability and limitations of common effluent treatment plants.

CO5. **Propose** possible effluent disposal methods.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

INDUSTRIAL WASTE AND WASTE MANAGEMENT
(Inter departmental Elective - I)

Course Code: A2148

L	T	P	C
4	-	-	4

SYLLABUS

UNIT – I

Quality requirements of boiler and cooling waters, Quality requirements of process water for Textiles, Food processing and Brewery Industries, Boiler and cooling water treatment methods. Basic Theories of Industrial Waste Water Management, Volume reduction and Strength reduction. Neutralization, Equalization and proportioning. Joint treatment of industrial wastes, consequent problems.

UNIT – II

Industrial waste water discharges into streams. Lakes and oceans and problems. Recirculation of Industrial Wastes. Use of Municipal Waste Water in Industries.

UNIT – III

Manufacturing Process and origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods.

Manufacturing Process and origin of liquid waste from Fertilizers, Distillers and Dairy, Special Characteristics, Effects and treatment methods.

UNIT – IV

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects and treatment methods.

UNIT – V

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

TEXT BOOK:

1. M.N. Rao and Dutta (2009), *Waste Water Treatment*, Oxford & IBH, New Delhi.

REFERENCE BOOKS:

1. Met Calf and Eddi (1979), *waste water engineering,* Mc Graw hill publications, New Delhi, India.
2. Mark J. Hammer and Mark J. Hammer (Jr) (2008), *Water and Waste Water technology*, Prentice Hall, NewYork.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

EXPERIMENTAL STRESS ANALYSIS
(Inter departmental Elective - I)

Course Code: A2330

L	T	P	C
4	-	-	4

Course Overview:

Experimental methods exploit a particular physical phenomenon to make measurements and hence only certain information that can be recorded by an experimental technique. The course introduces the physical principle used by various experimental techniques and also provides a guideline to select an experimental technique for a given application. The role of analytical, numerical and experimental methods in solving a problem in solid mechanics is discussed. Stress and strain at a point is discussed in most courses on solid mechanics but little attention is paid on the variation of these quantities over the field of the model. Attention is drawn on the richness of whole field information provided by most of the optical techniques.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Describe** various strain measuring devices and measure the strain

CO2. **Calculate** strains by using different strain gauge rosettes and circuits.

CO3. **Understand** different methods of 2 D photo-elasticity along with properties of different materials for strain measurement

CO4. **Explain** different types of coatings, test strain data using brittle coating and bi-refringent coating

CO5. **Identify** the defects of components by using various Non Destructive Testing methods

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

EXPERIMENTAL STRESS ANALYSIS
(Inter departmental Elective - I)

Course Code: A2330

L	T	P	C
4	-	-	4

SYLLABUS

UNIT I

MEASUREMENTS: Principles of measurements- Accuracy- Sensitivity and range of measurements. **EXTENSOMETER:** Mechanical- Optical- Acoustical and Electrical extensometers and their uses- Advantages and disadvantages.

UNIT II

ELECTRICAL RESISTANCE STRAIN GAUGES: Principle of operation and requirements- Types and their uses- Materials for strain gauge. Calibration and temperature compensation cross sensitivity- Rosette analysis- Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements- strain indicators.

UNIT III

PHOTOELASTICITY: Two dimensional photo elasticity- Concept of light – photo elastic effects- stress optic law- Interpretation of fringe pattern- Compensation and separation techniques- Photo elastic materials. Introduction to three dimensional photo elasticity.

UNIT IV

BRITTLE COATING AND MOIRE METHODS: Introduction to Moiré techniques- brittle coating methods and holography-applications.

UNIT V

NON–DESTRUCTIVE TESTING: Fundamentals of NDT- Radiography- ultrasonic- magnetic particle inspection- Fluorescent penetrate technique- Eddy current testing- Acoustic Emission Technique.

TEXT BOOKS:

1. Srinath- L.S.- Raghava- M.R.- Lingaiah- K.- Garagesha- G.- Pant B.- and Ramachandra- K.- “Experimental Stress Analysis”- Tata McGraw-Hill- New Delhi-1984.

REFERENCES:

2. Dally- J.W. - and Riley- W.F. - “Experimental Stress Analysis”- McGraw-Hill Inc.- New York- 2005- IV edition.
3. Hetyenyi- M. - “Hand book of Experimental Stress Analysis”- John Wiley and Sons Inc.- New York- 1972.
4. Pollock A.A. - “Acoustic Emission in Acoustics and Vibration Progress”- Ed. Stephens R.W.B.- Chapman and Hall-1993.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

IMAGE PROCESSING AND PATTERN RECOGNITION

(Inter departmental Elective - I)

Course Code: A2616

L	T	P	C
4	-	-	4

Course Overview:

Visual information plays an important role in almost all areas of our life. Today, much of this information is represented and processed digitally. Digital image processing is ubiquitous, with applications ranging from television to tomography, from photography to printing, from robotics to remote sensing.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the image formation model to human visual system in the perception of gray and color image.

CO2. **Identify** and exploit analogies between 1D and 2D signals in the frequency & spatial domain.

CO3. **Design** image enhancement processing algorithms by using various operators.

CO4. **Analyze** the image compression & segmentation standards & apply these techniques to real world problems.

CO5. **Expose** the principles of pattern recognition by applying basic of color and gray code transformations on a real imaginary data.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

IMAGE PROCESSING AND PATTERN RECOGNITION
(Interdepartmental Elective - I)

Course Code: A2616

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

FUNDAMENTALS OF IMAGE PROCESSING: Image acquisition, image model, sampling, quantization, relationship between pixels, distance measures, connectivity, image geometry, photographic film.
IMAGE TRANSFORMS: A detail discussion on Fourier transform, DFT, FFT, properties. A brief discussion on WALSH transform, WFT, HADAMARD transform, DCT.

UNIT - II
IMAGE ENHANCEMENT (by SPATIAL Domain Methods): Histogram Processing - definition, equalization, matching, local enhancement, use of histogram statics for image enhancement, Arithmetic and logical operations, pixel or point operations, size operations, Smoothing filters-mean, median, mode filters, sharpening spatial filtering.

IMAGE ENHANCEMENT (by FREQUENCY Domain Methods): Design of low pass, high pass, edge enhancement, smoothening filters in frequency domain. Butter worth filter, sharpening frequency domain filters, homomorphic filters in frequency domain.

UNIT - III
IMAGE COMPRESSION: Fundamentals, image compression models, elements of information theory, error-free compression, lossy compression, image compression standards.

UNIT - IV
IMAGE SEGMENTATION: Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersherds, the use of motion insegmentation.

UNIT - V
COLOR IMAGE PROCESSING: Fundamentals, models, pseudo color image, color transformation, smoothing, color segmentation, noise in color image, color image compression.

MORPHOLOGY: Dilation, erosion, opening, closing, hit-and-miss transform, boundary extraction, region filling, connected components, thinning, thickening, skeletons, pruning extensions to gray scale image application of morphology in image processing.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods (2008), *Digital Image Processing*, Low Price Edition, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. Arthur R. Weeks (1996), *Fundamentals of Electronic Image Processing*, Prentice Hall of India, New Delhi.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle (2008), *Image processing, Analysis and Machine vision*, Thomson Publications, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

DIGITAL ELECTRONICS AND MICROPROCESSORS
(Interdepartmental Elective - I)

Course Code: A2448

L	T	P	C
4	-	-	4

Course Overview:

Digital Electronics and Microprocessors are part of any electronic design today. This also happens to be one of the core subjects for the undergraduate students in Electronics, Electrical and Computer Engineering. It forms the basis of many of the next level courses. The proposed course on digital circuits will cover all the fundamental concepts in digital design. It will primarily focus on the prescribed GATE syllabus for Electronics and Communication Engineering (ECE) specialization. The course will start with the representations of numbers – different number systems and conversion between them, representation of integer and real numbers etc. This will be followed by combinational and sequential circuit design techniques. Data converters and semiconductor memories will be covered. Microprocessor 8085 will be discussed as a complete digital system example.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Demonstrate** the importance of various number systems and to perform different arithmetic operations on them.

CO2. **Make** use of Boolean algebra postulates-map and tabulation method to minimize Boolean functions and to implement with logic gates.

CO3. **Construct** and Analyze various combinational and sequential circuits used in digital systems such as adders, subtractors, code-convertors, decoders, encoders, multiplexer, flip flop, register and counters

CO4. **Understand** the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

DIGITAL ELECTRONICS AND MICROPROCESSORS
(Interdepartmental Elective - I)

Course Code: A2448

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

BINARY SYSTEMS: Digital Computers and Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, BinaryLogic.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions canonical and standard forms, other logic operations, Digital logicgates.

UNIT - II

SIMPLIFICATION OF BOOLEAN FUNCTIONS: The map method, Two, three, four and five variable maps, product of sums simplification, NAND and NOR implementation, other Two-level implementations, Don't-care conditions, Tabulation method, determination and selection of prime implicants

COMBINATIONAL LOGIC: Introduction, design procedure, Adders, Subtractors, magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Code converters and Parity Generators.

UNIT - III

SEQUENTIAL LOGIC: Introduction, latches, Flip-Flops, truth tables and excitation tables, triggering OF flip-flops, Registers, shift Registers, Ripple counters, shift register counters (Ring, Johnson and LFSR Counters).

UNIT - IV

8085 MICROPROCESSOR: Introduction to microprocessors, Architecture of 8085, Pin Diagram of 8085, Timing Diagram, Addressing Modes, Instruction Set, Interrupt structure of 8085.

UNIT - V

MICROPROCESSOR PERIPHERAL INTERFACING: Methods of Interfacing I/O Ports: I/O Mapped I/O, Memory Mapped I/O, Programmable Peripheral interface 8255 – Various Modes of Operation and Interfacing to 8085, Need for DMA, DMA data transfer Method, Interfacing with DMA Controller 8257.

TEXT BOOKS:

1. M. Morris Mano (2012), *Digital Design,* 4^{th} edition, Pearson Education/Prentice Hall of India,NewDelhi, India.
2. Ramesh S. Goankar(2011), Microprocessor Architecture, Programming and Applications with the 8085, Prentice Hall of India,India.

REFERENCE BOOKS:

1. C. V. S. Rao (2010), *Switching Theory and Logic Design*, Pearson Education India.
2. K. UdayKumar, B. S. UmaShankar (2008), t*he 8085Microprocessor Architecture, Programming and Interfacing*, Pearson Publications, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

HEAT TRANSFER LAB

Course Code: A2331

L	T	P	C
-	-	3	2

Course Overview:

This is a laboratory course in heat transfer to be taken in conjunction with the heat transfer theory course. Laboratory exercises will include studies of conduction, convection, and radiation heat transfer processes. Particular emphasis will be placed on thermal measurements including use of thermocouples. The Heat Transfer Laboratory experiments are set up so that experiments can be performed to complement the theoretical information taught in the heat transfer lecture course. This course deals with the experimental work in heat transfer lab covering measurement of thermal conductivity, Natural and forced convection, Radiation, and Heat exchangers.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Determine** the thermal conductivity and heat transfer coefficient of a given material.

CO2. **Estimate** the performance of heat exchangers and fins

CO3. **Determine** the heat transfer coefficient in convection process

CO4. **Compare** heat pipe performance with other pipes

CO5. **Determine** the emissivity of a given material

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

HEAT TRANSFER LAB

Course Code: A2331

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer through pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzmann Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Study of Two – Phase flow.

Note: Minimum 12 of the above experiments are to be conducted.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

METROLOGY AND INSTRUMENTATION LAB

Course Code: A2332

L	T	P	C
-	-	3	2

Course Overview:

The lab sessions are intended to make the students understand the different operations in machines such as Lathe, Drilling Machine, Milling Machine, Grinding Machine etc. The student will be provided with a raw metal piece along with the dimensions of the required work piece.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the procedures to measure length, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments.

CO2. **Inspect** machine tools whether properly aligned or not.

CO3. **Measure** the effective diameter of thread profile using different methods.

CO4. **Justify** the appropriate device for the measurement of parameters like temperature, pressure, speed, strain etc.

CO5. **Make use of** Seismic pick up to study mechanical vibrations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R14**

METROLOGY AND INSTRUMENTATION LAB

Course Code: A2332

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS

1. Measurement of length, height, diameter by Vernier calipers and outside micrometer etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth Vernier calipers for measuring the elements of spur gear.
4. Alignment test on the lathe machine.
5. Alignment test on milling machine.
6. Angle and taper measurements by Bevel protractor, Sine bars, etc.
7. Use of spirit level in finding the flatness of surface plate.
8. Measurement of pitch, thread angle o a screw thread by using tool makers' microscope.
9. Calibration of dead weight pressure gauge
10. Study and calibration of LVDT transducer for displacement measurement.
11. Calibration of strain gauges.
12. Calibration of thermocouple for temperature measurement.
13. Calibration of capacitive transducer for angular displacement.
14. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
15. Calibration of resistance temperature detector for temperature measurement.
16. Study and calibration of a rotameter for flow measurement.

Note: Minimum 12 of the above experiments are to be conducted.

SYLLABI FOR
VII SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

OPERATIONS RESEARCH

Course Code: A2333

L	T	P	C
4	0	0	4

Course Overview:

Operations Research is a science of modeling and optimization. It allows you to model real- world problems by using mathematical techniques. It provides the tools and theories to solve these real-world problems by finding the optimal solutions to the models subject to constraints of time, labor, resource, material, and business rules. With Operations Research, people make intelligent decisions to develop and manage their processes and businesses in various applications.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory and dynamic programming.

CO2. **Build** mathematical models for finding optimum solutions for various real world problems and case studies.

CO3. **Evaluate** various alternatives available to aid in effective decision making.

CO4. **Choose** the best strategies to maximize the profit in the presence of a competitor.

CO5. **Devise** operating policies for the efficient and effective management of men, materials and machines in inventory, production, distribution and service systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

OPERATIONS RESEARCH

Course Code: A2333

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO OPERATIONS RESEARCH: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem. Simplex Method, Artificial variables Techniques, big -M method, two - phase simplex method, degeneracy and unbound solutions.

UNIT - II

TRANSPORTATION PROBLEM: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions, North-West corner rule, least cost method and Vogel's approximation method. Optimality test – MODI method.

ASSIGNMENT MODEL: Formulation, Hungarian method for optimal solution, solving unbalanced problem, Traveling salesman problem as assignment problem.

UNIT - III

SEQUENCING MODELS: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

QUEUING THEORY: Introduction, Single Channel, Poisson arrivals, exponential service times with infinite population and finite population models.

UNIT - IV

REPLACEMENT MODELS: Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy.

INVENTORY MODELS: Inventory costs, Models with deterministic demand model: (a) Demand rate uniform and production rate infinite, (b) Demand rate non-uniform and production rate infinite, (c) Demand rate uniform and production rate finite.

UNIT - V

GAME THEORY: Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle, Rectangular games without saddle point, mixed strategy for 2 X 2 games.

DYNAMIC PROGRAMMING: Characteristics of dynamic programming, Dynamic programming approach for priority management employment smoothening, Capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.

TEXT BOOKS:

1. A. M. Natarajan, P. Balasubramani, A. Tamilarasi (2006), *Operations Research*, Pearson Education, India.
2. S. D. Shama (2009), *Operation Research,* Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. J. K. Sharma (2007), *Operations Research – Theory and Applications,* 3rd edition, Macmillan India Ltd,India.
2. R. Panneerselvam (2008), *Operations Research*, 2nd edition, Prentice Hall of India, India.
3. F. S. Hillier, G. J. Lieberman (2007), *Introduction to Operations Research,* 8th edition, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

CAD/CAM

Course Code: A2334

L	T	P	C
3	1	0	4

Course Overview:

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) are two classes of application programs that help the user to design and build simple or complex products, assemblies, and plants. Nowadays, with the advent of fast personal computers, user friendly GUI interfaces, and much more efficient calculation algorithms, CAD/CAM has become a household name in the engineering and manufacturing field. In fact, because of these tools, an engineer has become a designer, eliminating the need for a full time drafter.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** various elements of computers, computer graphics, product cycle in manufacturing industry, drafting and modeling systems.

CO2. **Model** various synthetic curves and surfaces.

CO3. **Develop** NC part programming, group technology and computer aided process planning

CO4. **Perceive** quality using computer aided quality control techniques.

CO5. **Make use of** computer integrated manufacturing systems in industries.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

CAD/CAM

Course Code: A2334

L	T	P	C
3	1	0	4

SYLLABUS

UNIT – I

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, and storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT –II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, and solid modeling.

UNIT – III

NUMERICAL CONTROL: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining centre, turning centre, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

GROUP TECH: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – IV

COMPUTER AIDED QUALITY CONTROL: Terminology in quality control, the computer in QC, contact inspection methods, non contact inspection methods-optical, non contact inspection methods-non optical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – V

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMSbenefits.

TEXT BOOKS:

1. Zimmers, P. Groover (2010), *CAD / CAM*, 3 rd edition, Prentice Hall of India, NewDelhi.
2. Ibrahim Zeid(2011), *CAD / CAM Theory and Practice*, 4th edition, Tata McGraw Hill education (P) Ltd, NewDelhi,India.

REFERENCES:

1. P. Groover(2011), *Automation, Production systems and Computer integrated Manufacturing*, 3rd edition, Pearson Publications, India.
2. Radhakrishnan, Subramanian (2009), *CAD / CAM / CIM*, New Age International Pvt. Ltd, New Delhi, India
3. Alavala, C. R (2012), *CAD/CAM: Concepts and Applications*, 1st edition, Prentice Hall of India, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

COMPUTATIONAL FLUID DYNAMICS

Course Code: A2335

L	T	P	C
4	0	0	4

Course Overview:

Fluid dynamics is the science of fluid motion. This course provides core knowledge of the fundamentals of CFD for engineers, and an introduction to the methods and analysis techniques used in CFD. It also provides an introduction to the use of commercial CFD codes to analyze flow and heat transfer in problems of practical engineering interest. At the end of the course the learners will understand the process of developing a geometrical model of the flow, applying appropriate boundary conditions, specifying solution parameters, and visualising and analysing the results. Through the course study, the learners will also become conscious of the limitations of CFD and develop an appreciation for the factors limiting the accuracy of CFD solutions.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the governing differential equations for fluid dynamics problems.

CO2. **Explain** computational fluid dynamics problems, discretization techniques and error analysis for stability.

CO3. **Evaluate** general transformation equations for grid generations.

CO4. **Develop** algorithms for flow field analysis.

CO5. **Analyze** turbulence models for different Reynolds numbers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

COMPUTATIONAL FLUID DYNAMICS

Course Code: A2335

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I:

INTRODUCTION AND GOVERNING EQUATIONS

BASICS: Introduction to computational fluid dynamics, Research tool, Design Tool, Finite control volume, infinitesimal fluid element, substantial derivatives, divergence of Velocity. Governing equations of fluid dynamics: the continuity equation, the momentum equation, the energy equation, physical boundary conditions

UNIT II:

DISCRETIZATION: Introduction, Finite differences, difference equations, Explicit and implicit approaches, Errors and an analysis of stability.

UNIT III:

GRID GENERATION

Grid generation – General transformation of the equations - Form of the governing equations suitable for CFD – Boundary fitted co-ordinate systems – Elliptic grid generation - Adaptive grids - Modern developments in grid generation. Steady state one dimensional heat conduction and convection.

UNIT IV:

FLOW FIELD ANALYSIS

Finite volume methods -Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, simple algorithm and its variants – PISO algorithms.

UNIT V:

TURBULENCE MODELS AND MESH GENERATION

Turbulence models, mixing length model, Two equation (k-Є) models – High and low Reynolds number models – Structured Grid generation – Unstructured Grid generation.

TEXT BOOKS

1. K.A. Hoffman, (2000), Computational Fluid Dynamics for Engineering, Vol I - III Engineering Education System, Austin, Texas.
2. J.D. Anderson, Jr., (2000), Computational Fluid Dynamics – The basics with applications, McGraw-Hill, Incs.
3. T. J. Chung (2010), Computational Fluid Dynamics, 2nd edition, Cambridge University Press, Cambridge, UK.

REFERENCE BOOKS

1. K. Muralidhar, T. Sundarajan, (2001), Computational Fluid Flow and Heat Transfer, Narosa Publishing House, NewDelhi.
2. S.V. Patankar, (1999), Numerical Heat Transfer and Fluid Flow, Hemisphere, New York.
3. V.V. Ranade, (2002), Computational Flow Modeling for Chemical Reactor Engineering, Academic Press

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

REFRIGERATION AND AIR-CONDITIONING

Course Code: A2336

L	T	P	C
4	0	0	4

Course Overview:

Systematic approach to study the basic concepts of refrigeration and air-conditioning and its applications. This course consists the types of refrigeration systems like air refrigeration system, vapour compression refrigeration system, vapour absorption system, steam jet refrigeration system, thermo-electric refrigeration system, vortex tube and comparison among various refrigeration systems. It will be useful to study the types of refrigerants and components of various refrigeration systems. Air-Conditioning focuses on its basic concepts and types of air conditioning systems, various components used in air-conditioning system. It describes the concept of effective temperature, comfort chart and heat pump circuits.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the basic concepts and working of various refrigeration and air-conditioning systems

CO2. **Describe** the components and equipment's of different refrigeration and air conditioning systems.

CO3. **Compare** the performance of different refrigeration and air conditioning systems.

CO4. **Solve** problems of different refrigeration and air conditioning systems.

CO5. **Design** of air conditioning system for load calculations

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

REFRIGERATION AND AIR-CONDITIONING

Course Code: A2336

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO REFRIGERATION: Necessity and applications, Unit of refrigeration and C.O.P, Mechanical Refrigeration, Types of Ideal cycles of refrigeration. Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems, Actual air refrigeration system problems, and Refrigeration needs of Air craft's.

UNIT - II

VAPOUR COMPRESSION REFRIGERATION SYSTEMS: Working principle and essential components of the plant, simple vapour compression refrigeration cycle, COP, Representation of cycle on T-S and p-h charts, effect of sub cooling and super heating, Cycle analysis, Actual cycle, Influence of various parameters on system performance, Use of p-h charts, numerical Problems.

VAPOUR ABSORPTION SYSTEMS: Calculation of COP, description and working of NH_3-water system and LiBr-water (Two shell & Four shell) System. Principle of operation Three Fluid absorption system, salient features.

UNIT -III

SYSTEM COMPONENTS: Evaporators, classification, Working Principles, Expansion devices, Types, Working Principles.

REFRIGERANTS: Desirable properties, classification, refrigerants used Nomenclature, Ozone Depletion, and Global Warming.

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilschtube.

UNIT - IV

INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes, Characterization of Sensible and latent heat loads, Need for Ventilation, Consideration of Infiltration, Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP.

UNIT – V

COMFORT AIR CONDITIONING: Requirements of human comfort and concept of effective temperature-Comfort chart, Comfort Air conditioning, Requirements of Industrial air conditioning.

AIR CONDITIONING SYSTEM-Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers, Heat Pump, Heat sources, Different heat pump circuits.

TEXT BOOKS:

1. Domkundwar, S. C. Arora (2009), *A Course in Refrigeration and Air conditioning*, 6th edition, Dhanpatrai Publications, New Delhi, India.
2. C.P. Arora(2009), *Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Manohar Prasad(2010), *Refrigeration and Air Conditioning*, Revised 2nd edition, New Age International Pvt. Ltd., New Delhi, India.
2. S. S. Thipse (2005), *Refrigeration and Air Conditioning,* 1st edition, Jaico Publishing House, Mumbai, India.
3. Ananthanarayanan (2009), *Basic Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS
(Inter departmental Elective - II)

Course Code: A2015

L	T	P	C
4	-	-	4

Course Overview:
This course deals with ethics and human values, intellectual properties, trademarks, copy rights and patents and laws for professional development of the socially responsible engineers.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Acquires the basic concepts of Professional ethics and human values & Students also gain the connotations of ethical theories.

CO2. Knows the duties and rights towards the society in an engineering profession

CO3. Would realize the importance and necessity of intellectual property rights.

CO4. Can take all the necessary precautions while conducting the experiments, which may reduce the risk.

CO5. Understands the importance of risk evacuation system in reality and takes the utmost responsibility while handling the risky situations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS
(Inter departmental Elective - II)

Course Code: A2015

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

ENGINEERING ETHICS: Senses of 'Engineering Ethics' -Variety of moral issues - Types of inquiry –Moral dilemmas Moral autonomy -Kohlberg's theory Gilligan's theory -Consensus and controversy – Models of Professional Roles -Theories about right action- Self interest - Customs and religion -Uses of Ethical theories.

HUMAN VALUES: Morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, co-operation, commitment, empathy, self- confidence, character and spirituality.

UNIT - II

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study.

UNIT - III

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the Three Mile Island and Chernobyl case studies. Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, occupational crime, professional rights, employee rights

UNIT - IV

INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

TRADEMARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trademarks, trademark registration process.

UNIT - V

LAW OF COPY RIGHTS: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copyright.

LAW OF PATENTS: Foundation of patent law, patent searching process, ownership rights and transfer.

NEW DEVELOPMENTS IN INTELLECTUAL PROPERTY: Trademark law; Copy right law and Patent law, Trade secrets law, Intellectual property audits.

TEXT BOOKS:

1. MikeMartin,RolandSchinzinger(1996),*EthicsinEngineering*,McGraw-Hill,NewYork.
2. GovindarajanM,NatarajanS,SenthilKumarV.S(2004),*EngineeringEthics*,PrenticeHallofIndia,NewDelhi, India.
3. Deborah.E.Bouchoux(2009*),Intellectualproperty*,Cengagelearning,India.
4. Deborah.E.Bouchoux(2001),*Protectingyourcompaniesintellectualproperty*,AMACOM, USA.

REFERENCE BOOKS:

1. CharlesD.Fleddermann(2004),*EngineeringEthics*,PearsonEducation/PrenticeHall,NewJersey.
2. Charles E Harris, Michael S. Protchard, Michael J Rabins(2000), *Engineering Ethics - Concepts and Cases*, Wadsworth Thompson Learning, United States.
3. JohnRBoatright(2003),*EthicsandtheConductofBusiness*,PearsonEducation,NewDelhi.
4. Edmund G Seebauer and Robert L Barry, (2001), *Fundamentals of Ethics for Scientists and Engineers,* Oxford University Press, New York.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

HUMAN RESOURCE MANAGEMENT
(Inter departmental Elective - II)

Course Code: A2016

L	T	P	C
4	-	-	4

Course Overview:

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Handle** HR functions effectively in the real life with the knowledge of HRM concepts

CO2. **Demonstrate** how the HR manager is playing proactive role in business to meet global business challenges.

CO3. **Apprise** the performance of the employees by using different methods

CO4. **Take** decisions relating to compensation and conflict resolution

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

HUMAN RESOURCE MANAGEMENT
(Interdepartmental Elective - II)

Course Code: A2016

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

INTRODUCTION HUMAN RESOURCE MANAGEMENT: Introduction and significance of HRM, Scope, functions of HRM, changing environment of HRM and Challenges. Human Resource Planning, Objectives, Factors influencing Human Resource planning, HR Planning Process.

UNIT - II

JOB ANALYSIS AND RECRUITMENT: Process and Sources of Recruitment; Selection, process of selection and techniques, Retention of Employees.

UNIT - III

HUMAN RESOURCES DEVELOPMENT: Training Vs Development, Need, Process of training, Methods of training, Training Evaluation, Career planning, Performance Management System, Methods of Appraisal, Common Errors.

UNIT - IV

COMPENSATION MANAGEMENT: Concepts and components of wages, Factors influencing wage fixation, Job evaluation, Methods of payment, Incentives and Fringe benefits.

UNIT - V

MANAGING INDUSTRIAL RELATIONS: Components of Industrial Relation, Trade Unions, and functions of Trade Union, Employee Participation, Importance and Schemes, Collective Bargaining, Grievance Redressal, Industrial Dispute Settlement machinery.

TEXT BOOKS:

1. Biswajeet Pattnayak (2009), *Human Resource Management*, Prentice hall of India, New Delhi, India.
2. R. Wayne Mondy and Robert M. Noe (2009), *Human Resource Management*, Pearson, India.

REFERENCE BOOKS:

1. Aswathappa. K. (2007), *Human Resources and Personnel Management*, Tata MC Graw Hill, New Delhi,India.
2. Monappa. A, Saiyadain. M. (1979), *Personnel Management*, Tata Mc Graw Hill, New Delhi, India.
3. C. B. Mamoria (2003), *Personnel Management*, Himalaya Publishing House, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

ENTERPRENEURSHIP

(Inter departmental Elective - II)

Course Code: A2017

L	T	P	C
4	-	-	4

Course Overview:

This course provides an introduction to the principles of entrepreneurship. Topics include self-analysis of entrepreneurship readiness, the role of entrepreneur in economic development, legal problems, role of Government; Role of IDBI, SIDBI, SIDO, NIESBUD, SISI, DIC, Entrepreneurship Development Institute, MSMEs. Sources of financing, budgeting and cash flow. Women entrepreneurship and project management.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs.

CO2. **Various** Institutional supports for setting up a business enterprise.

CO3. **Role**, importance and functions of women entrepreneur and women entrepreneur development.

CO4. **Concept** of Project Management and steps in Project development.

CO5. **Training** programs to inculcate entrepreneurial spirit and different training institutions to impart training to entrepreneurs.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

ENTERPRENEURSHIP
(Inter departmental Elective - II)

Course Code: A2017

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

ENTREPRENEURSHIP: Importance and role of entrepreneurship, Characteristics of entrepreneurship, Qualities of an entrepreneur, Functions of entrepreneur; Theories of entrepreneurship, Stimulants of entrepreneurship and Barriers to entrepreneurship, Ethics and Social Responsibility, Role of entrepreneur in economic development.

UNIT - II

INSTITUTIONAL SUPPORT: Role of Government; Role of IDBI, SIDBI, SIDO, NIESBUD, SISI, DIC, Entrepreneurship Development Institute, MSMEs.

UNIT - III

WOMEN ENTREPRENEURSHIP: Role & Importance, Functions of women entrepreneur, Profile of Indian Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India and in Foreign Countries.

UNIT - IV

PROJECT MANAGEMENT: Concept of project and classification of project identification, project formulation - project report - project design, Project appraisal - profitability appraisal - project planning - social cost benefit analysis - financial analysis and project financing.

UNIT - V

TRAINING: Designing appropriate training programmes to inculcate Entrepreneurial Spirit, significance of entrepreneurial training, Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees.

TEXT BOOKS:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), E*ntrepreneurship*, Tata Mc Graw Hill, NewDelhi.

REFERENCE BOOKS:

1. Bholanath Datta (2009), *Entrepreneurship*, Excel publications, India.
2. David H Holt (2010), *Entrepreneurship*, Prentice hall of India, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

BUSINESS COMMUNICATION
(Inter departmental Elective - II)

Course Code: A2018

L	T	P	C
4	-	-	4

Course Overview:

The aim of this course is to develop student's communication skills in the English language that will enable them to function effectively in a business environment. The course content focuses on selected written and oral forms of communication related to topics and issues critical to students of Business Studies.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. To understand and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.

CO2. To understand the importance of specifying audience and purpose and to select appropriate communication choices.

CO3. To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.

CO4. To participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.

CO5. To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

BUSINESS COMMUNICATION
(Inter departmental Elective - II)

Course Code: A2018

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

INTRODUCTION TO MANAGERIAL COMMUNICATION: Meaning, Importance and objectives, Principles of Communication, Forms of communication, Communication Process, Barriers To effective communication, Gateways to effective communication.

UNIT - II

NONVERBAL COMMUNICATION: Body Language, Gestures, Postures, Facial Expressions, Dress Code. Listening and Speaking Skills, Probing questions, Observation, Business and Social etiquette.

UNIT - III

MANAGERIAL SPEECHES: Principles of Effective Speech & Presentations. Technical and Non-technical presentations. Speech of introduction, speech of thanks, occasional speech, theme speech, Use of audio visual aids.

UNIT - IV

INTERVIEW TECHNIQUES: Mastering the art of conducting and giving interviews, Placement interviews, discipline/technical interviews, appraisal interviews, exit Interviews. *Group communication*: Importance, Meetings, group discussions, Videoconferencing.

UNIT - V

INTRODUCTION TO BUSINESS CORRESPONDENCE: *Business letters*: Enquiries, Circulars, Quotations, Orders, Acknowledgments, Executions, Complaints, Persuading letters, Sales letters, Job application letters, Bio-data, Covering Letter, Interview Letters, Letter of Reference, Memos, minutes, Circulars and Notices. *Reports:* Types of Business Reports - Format, Choice of vocabulary, Coherence, paragraph writing, organization reports by individual,Report by committee.

TEXT BOOKS:

1. Lesikar R. V, Flatley M. E (2005), *For Empowering the Internet Generation*, Tata McGraw Hill Publishing Company Ltd., New Delhi,India.
2. Ludlow. R, Panton. F (1998), *The Essence of Effective Communications*, Prentice Hall of India Pvt. Ltd., New Delhi,India.

REFERENCE BOOKS:

1. Adair.J (2003), *Effective Communication,* Pan Macmillan,London.
2. Pan Mcmillan Thill J. V, Bovee G. L (1993), *Excellence in Business Communication,* Tata McGraw Hill, NewYork.
3. Bowman J.P, Branchaw P. P (1987), *Business Communications: From Process to Product*, Dryden Press,Chicago.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

PROJECT PLANNING AND MANAGEMENT
(Inter departmental Elective - II)

Course Code: A2019

L	T	P	C
4	-	-	4

Course Overview:

Project planning is at the heart of the project life cycle, and tells everyone involved where you're going and how you're going to get there. The planning phase is when the project plans are documented, the project deliverables and requirements are defined, and the project schedule is created. It involves creating a set of plans to help guide your team through the implementation and closure phases of the project. The plans created during this phase will help you manage time, cost, quality, changes, risk, and related issues. They will also help you control staff and external suppliers to ensure that you deliver the project on time, within budget, and within schedule.

Project management is a start-to-finish approach to getting things done and making projects more successful. It's a profession, but it's also a set of techniques that anyone can apply to achieve goals and manage project work more effectively. Project management can be used to guide small, simple projects as well as complex enterprise-wide initiatives.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **DEVELOP** an evidenced based project management plan which addresses all elements of the project development life cycle

CO2. **ANALYZE** and synthesize project management theory and apply this knowledge in project management

CO3. **Critically** EVALUATE decision making and its impact on project success

CO4. **APPLY** effective team work and communication skills to develop and communicate a feasible and strategic project plan

CO5. **DEMONSTRATE** effective project execution and control techniques that result in successful projects

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

PROJECT PLANNING AND MANAGEMENT
(Inter departmental Elective - II)

Course Code: A2019

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

PERT AND CPM : Introduction, origin of PERT and CPM, planning, scheduling and controlling, bar charts, milestone charts, weaknesses in bar charts, PERT and CPM networks comparison, event, activity, rules for drawing networks, numbering the events (Fulkerson's law), dummy activities.

UNIT - II

CPM - PERT NETWORK ANALYSIS : Time estimate, expected time, earliest allowable occurrence time, latest allowable occurrence time, slack, project duration, probability of completion, start and finish time estimates, floats, project scheduling, critical and sub-critical path. Updating - process of updating, when to update.

UNIT - III

CPM COST MODEL & RESOURCES ALLOCATIONS, RESOURCE SCHEDULING: Cost analysis, direct and indirect costs, operation time, normal and crash times and costs, optimizing project cost, crash limit, free float limit, optimization. Resource smoothening, resource leveling.

UNIT - IV

MANAGEMENT: Scope of construction management, significance of construction management, concept of scientific management, psychology in management, a historical account of management philosophy, qualities of manager, the roles/functions performed by effective and competent managers, the manager - as a decision maker, as a motivator, as a communication-link, as a conflict resolver, as a well wisher of co- employees and the employer, etc.,

UNIT - V

ORGANIZATION: Types of organization, merits and demerits of different types of organization, authority, policy, recruitment process and training; development of personnel department; labor problems; labor legislation in India; 'workmen's compensation act of 1923 and minimum wages act of 1948', and subsequent amendments. Safety in construction.

TEXT BOOKS

1. Punmia,Khandelwal(2006),*Projectplanningandcontrolwith PERTandCPM*,3rd edition,Laxmi Publications, New Delhi, India.

REFERENCE BOOKS:

1. L.S. Srinath(1975),*PERT andCPM*,2ndEdition, Afflicted East West Press Pvt. Ltd, New Delhi, India.
2. U. K. Shrivastava (1999), Construction Planning and Management, Galgotia Publications Pvt. Ltd., NewDelhi**,**

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

ORGANIZATIONAL BEHAVIOUR
(Inter departmental Elective - II)

Course Code: A2020

L	T	P	C
4	-	-	4

Course Overview:

This course deals behaviour of individuals and groups as part of the social and technical system in the workplace. They examine individual and group behaviour, communication, conflict and various management styles, motivational techniques and coordination in the work environment and apply these concepts to the development of an organization's human resources.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Knows how people behave under a variety of conditions and contribute towards achievement of their goals.

CO2. Learns the factors to motivate people and leadership styles exhibit by the managers to get the things done through subordinates.

CO3. Able to understand the managerial strategies in achieving the goals of organizations.

CO4. Able to understand organizations and its structures.

CO5. Understand stress management and conflict resolution mechanism to resolve differences among people in organizations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

ORGANIZATIONAL BEHAVIOUR
(Interdepartmental Elective - II)

Course Code: A2020

L	T	P	C
4	-	-	4

SYLLABUS

UNIT - I

NATURE AND IMPORTANCE OF ORGANIZATIONAL BEHAVIOR: Foundation of O.B.; Conceptual Model for O.B. –Organization System in Global Environment – Importance of Interpersonal Skills, Challenges & Opportunities for O.B., Developing O.B. Model – Approaches to O.B.

UNIT - II

INDIVIDUAL BEHAVIOR – Diversity – Biographical Characteristics Ability – Implementing Diversity Management – Strategies – Attitudes & Job Satisfaction.

PERSONALITY: Theories of Personality –Perception – Process of Perception – Perception & Individual Decision Making – Motivation from concepts to Applications.

UNIT - III

GROUP BEHAVIOR – Foundations of Group Behavior – Defining and Classifying Groups – Stages of Group Development – Group Properties – Roles – Norms – Status, Size and Cohesiveness – Group Decision Making

– Understanding Work Teams – Types of Teams – Creating Effective Teams.

LEADERSHIP THEORIES: Leadership Theories – Challenges to Leadership Construct – Finding and Creating Effective Leaders – Power & Polities.

UNIT - IV

MOTIVATION THEORIES: Maslow's Hierarchy of Needs, Two- factor theory of Motivation, Alderfer's ERG theory, McClelland's need based Motivational Model, Douglas McGregor Theories of X and Y.

FOUNDATION OF ORGANIZATIONAL STRUCTURE: Nature of organizing, organizational levels and span of control and types of span of control, factors determining span, organizational structure, departmentation and types of departmentation, making organizing effective.

UNIT - V

ORGANIZATIONAL CULTURE AND CLIMATE: Conflicts management, Organization Change & Stress Management – Self Management – Managing Careers.

TEXT BOOKS:

1. Stephen P. Robbins, Timothy (2012)*, Organization Behaviour*, Ed. 14, Pearson Publications.
2. Mirza S Saiyadain (2011), *Organisation Behaviour*, TMH, New Delhi
3. Aryasri & VSP Rao (2009), *Management and Organisational Behaviour*, Excel Publications.

REFERENCE BOOKS:

1. Kavitha Singh (2009), *Organisational Behaviour*, Pearson Publications
2. Aswathappa (2009), *Organisational Behaviour*, Himalaya Publications
3. John M. Ivancevich (2009), *Organisational Behaviour & Management*, TMH, New Delhi
4. Koontz, Weihrich & Aryasri (2009), *Principles of Management*, TMH, New Delhi
5. Luthans, Fred (2009), *Organisational Behaviour*, 11/e, McGraw Hill, 2009.
6. Pierce and Gardner (2009), *Management and Organisational Behaviour: An Integrated Perspective*, Cengage
7. Deepak Kumar Bhattacharyya (2012), *Principles of Management-text and cases*, Pearson

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

AUTOMOBILEENGINEERING
(Professional Elective - I)

Course Code: A2337

L	T	P	C
3	1	-	4

Course Overview:

The course aims to impart basic skills and understanding of automotive electrical and mechanical systems, equipments and their working details. Fundamentals related to vehicle and its systems' layouts, basic design of vehicle body structure and selection of systems Components are introduced.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the working components of four wheeler automobiles.

CO2. **Classify** the different ignition systems used in automobiles.

CO3. **Differentiate** various types of automobile transmission systems.

CO4. **Elaborate** the requirements of fuel injection systems used in automobiles.

CO5. **Discuss** the steering control mechanism used in automobile.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

AUTOMOBILEENGINEERING
(Professional Elective - I)

Course Code: A2337

L	T	P	C
3	1	-	4

SYLLABUS

UNIT – I

INTRODUCTION: Components of four wheeler automobile, chassis and body, power unit, power transmission, rear wheel drive, front wheel drive, turbo charging and super charging, engine lubrication-splash and pressure lubrication systems, oil filters, oil pumps , crank case ventilation , engine service, reboring, decarbonisation, Nitriding of crank shaft..

UNIT – II

FUEL SYSTEM: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump, filters, carburettor, types, air filters, petrol injection.

ENGINES: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, Emission from Automobiles, Pollution standards National and international, Pollution Control, Techniques, Multipoint fuel injection for SI Engines.

UNIT - III

COOLING SYSTEM: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators, Types, Cooling Fan - water pump, thermostat, evaporating cooling, and pressure sealed cooling, antifreeze solutions.

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug, Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers.

UNIT – IV

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel, gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft, Hotch, Kiss drive, Torque tube drive, universal joint, differential rear axles, types, wheels and tiers.

BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes

UNIT - V

STEERING SYSTEM: Steering geometry, camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism, steering gears , types, steering linkages.

SUSPENSION SYSTEM: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

TEXT BOOKS:

1. Kirpal Singh (2012), Automobile Engineering - Vol. 1 &2, 12th edition, standard publishers, New Delhi, India.
2. William Crouse (2012), Automobile Engineering (SIE), 10th edition, Tata McGraw hill education(P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. B. S. Narang (2011), Automobile Engineering, 5th edition, Karman publishers, New Delhi, India.
2. J. B. Gupta (2012), Automobile Engineering, satya prakhashan, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

THEORY OF PLATES AND SHELLS
(Professional Elective - I)

Course Code: A2338

L	T	P	C
4	0	0	4

Course Overview:

This course deals with the theory and design of thin shell structures, using the membrane and bending theories for of plates and shells of revolution and translation, and their application to analysis of cylindrical shells. Navier's method for simply supported plates, Levy's method for general plates. The course also introduces the finite element method for plate bending.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** behaviour of the plates and shells with different geometry under various types of loads.

CO2. **Analyze** various theories for plate and shells to perform stability analysis

CO3. **Formulate** Finite Element Equations for solution of the structural response of plate bending problems

CO4. **Solve** plate and shell problems by computing numerical approximations.

CO5. **Apply** the structural mechanics approximations of membrane, plates and shells

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

THEORY OF PLATES AND SHELLS
(Professional Elective - I)

Course Code: A2338

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I

Simple bending of Plates-Assumptions in thin plate theory-Different relationships- Different Boundary Conditions for plates- Plates subjected to lateral loads – Navier's method for simply supported plates – Levy's method for general plates – Example problems with different types of loading.

UNIT II

PLATE OF VARIOUS SHADES: Navier's Method of Solution for Simply Supported Rectangular Plates – Leavy's Method of Solution for Rectangular Plates under Different Boundary Conditions. Governing Equation – Solution for Axi-symmetric loading – Annular Plates – Plates of other shapes

UNIT III

Eigenvalue analysis, stability and free vibration analysis of rectangular plates. Circular plates subjected to Axi-symmetrical loads–concentrated load, uniformly distributed load and varying load – Annular circularplate with end moments.

UNIT IV

Rayleigh-Ritz method – Application to different problems – Finite difference method – Finite element methodology for plates-Orthotropic Plates

UNIT V

Shells- Classification of shells - Membrane and bending theory for singly curved and doubly curved shells - Various approximations -Analysis of folded plates

TEXTBOOKS:

1. Timoshenko, S.P. Winowsky. S., and Kreger, "Theory of Plates and Shells", McGraw-Hill Book Co. 1990

REFERENCE BOOKS:

1. Flugge, W. "Stresses in Shells", Springer – Verlag,1985.
2. Timoshenko, S.P. and Gere, J.M., "Theory of Elastic Stability", McGraw-Hill Book Co.1986.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

MECHATRONICS
(Professional Elective - I)

Course Code: A2339

L	T	P	C
3	1	-	4

Course Overview:

This course is an introduction to designing mechatronic systems, which require integration of the mechanical and electrical engineering disciplines within a unified framework. There are significant laboratory-based design experiences. Topics covered in the course include: Low-level interfacing of software with hardware; use of high-level graphical programming tools to implement real-time computation tasks; digital logic; analog interfacing and power amplifiers; measurement and sensing; electromagnetic and optical transducers; control of mechatronic systems.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Describe** the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems.

CO2. **Analyze** the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems.

CO3. **Analyze** the performance of devices using microcontrollers.

CO4. **Develop** the mechanical systems using the micro controllers and programmable logic controllers

CO5. **Design** a system, component, or process to meet desired needs within realistic constraints.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

MECHATRONICS
(Professional Elective - I)

Course Code: A2339

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Definition, Trends, Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, and Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

PRECISION MECHANICAL SYSTEMS: Pneumatic Actuation Systems, Electro-pneumatic Actuation Systems, Hydraulic Actuation Systems , Electro-hydraulic Actuation Systems - Timing Belts , Ball Screw and Nut, Linear Motion Guides , Linear Bearings , Harmonic Transmission , Bearings- Motor / Drive Selection.

UNIT – II

SIGNAL CONDITIONING: Introduction, Hardware, Digital I/O, Analog input, ADC, resolution, sped Channels Filtering Noise using passive components, Resistors, capacitors-Amplifying signals using OP amps, Software, Digital Signal Processing, Low pass, high pass, notch filtering.

UNIT - III

ELECTRONIC INTERFACE SUBSYSTEMS: TTL, CMOS interfacing - Sensor interfacing , Actuator interfacing, solenoids, motors Isoation schemes- opto coupling, buffer IC's - Protection schemes , circuit breakers, over current sensing, resettable fuses, thermal dissipation, Power Supply - Bipolar transistors / mosfets

ELECTROMECHANICAL DRIVES: Relays and Solenoids, Stepper Motors - DC brushed motors, DC brushless motors, DC servo motors, 4-quadrant servo drives, PWM's, Pulse Width Modulation, Variable Frequency Drives, Vector Drives, Drive System load calculation.

UNIT - IV

MICROCONTROLLERS OVERVIEW: 8051 Microcontroller, micro processor structure, Digital Interfacing - Analog Interfacing - Digital to Analog Convertors, Analog to Digital Convertors, Applications. Programming, Assembly, C (LED Blinking, Voltage measurement using ADC).

PROGRAMMABLE LOGIC CONTROLLERS: Basic Structure, Programming : Ladder diagram , Timers, Internal Relays and Counters, Shift Registers, Master and Jump Controls, Data Handling, Analog input / output - PLC Selection, Application.

UNIT - V

PROGRAMMABLE MOTION CONTROLLERS: Introduction, Feedback Devices, Position, Velocity Sensors, Optical Incremental encoders, Proximity Sensors, Inductive, Capacitive, Infrared, Continuous and discrete processes, Control System Performance & tuning, Digital Controllers, P, PI, PID Control.

TEXT BOOKS:

1. W. Bolton (2012), Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering,4th edition, Pearson Education, New Delhi, India.
2. N. Shanmugam (2010), Mechatronics, 2nd edition, Anuradha Agencies Publishers, Chennai, India.
3. R. K. Rajput (2012), A text book of Mechatronics, 1st edition, S. Chand & Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Bradley (2010), Mechatronics, 4th edition, prentice Hall of India, New Delhi, India.
2. HMT. Ltd (1998), Mechatronics, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, India.
3. M. D. Singh, J. G. Joshi (2011), Mechatronics, 1st edition, Prentice Hall of India Pvt. Ltd., New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

BOUNDARY LAYERTHEORY
(Professional Elective - I)

Course Code: A2340

L	T	P	C
3	1	-	4

Course Overview:

This course introduces the concept of a boundary layer and the physical concepts of boundary layer thickness (δ), displacement thickness (δ *), momentum thickness (θ) and friction drag. It derives Prandtl's Boundary Layer Equations for laminar boundary layers from the basic Navier-Stokes equations and discusses their exact solutions. It discusses how a laminar boundary layer transitions to turbulence and separates. It also discusses thermal boundary layers.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Apply** the basic laws of fluid flow and evaluate continuity, momentum and energy equations.

CO2. **Identify** boundary layer thickness, displacement, momentum and energy thickness for viscous and non viscous fluid flows.

CO3. **Determine** laminar boundary layer past the flat plate, cylinder, flow separation and temperature profiles.

CO4. **Develop** Navier stokes equations for liquids and gases.

CO5. **Analyze** boundary layer methods for different flows.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

BOUNDARY LAYERTHEORY
(Professional Elective - I)

Course Code: A2340

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

BASIC LAWS: Basic laws of fluid flow: Continuity, momentum and energy equations as applied to system and control volume, Concept of flow fields.

UNIT - II

FUNDAMENTALS OF BOUNDARY LAYER THEORY: Viscous fluid flow, Boundary conditions. Development of boundary layer, Estimation of boundary layer thickness. Displacement thickness, momentum and energy thickness for two dimensional flows. General stress system in a deformable body, General strain system.

UNIT - III

LAMINAR BOUNDARY LAYER: Analysis of flow past a flat plate and a cylinder, Integral relation of Karman, Integral analysis of energy equation, laminar boundary layer equations, Flow separation, Blasius solution for flat–plate flow, Boundary layer temperature profiles for constant plate temperature.

UNIT - IV

NAVIER STOKES EQUATION: Relation between stress and strain system in a solid body (Hooke's Law). Relation between stress and strain rate system in liquids and gases (Stroke's Law). The Navier - Strokes Equation (N-S), General properties of Navier - Stokes Equation.

EXACT SOLUTION OF N-S EQUATION: Two dimensional flow through a straight channel, Hagen - Poiseulle flow, suddenly accelerated plane wall, Flow near a rotating disk, Very slow motion: Parallel flow past a sphere.

UNIT – V

BOUNDARY LAYER METHODS: Falkner Skan Wedge flows, Integral equation of Boundary layer - Pohlhausen method, Thermal boundary calculations: One parameter and two parameter integral methods.

TEXT BOOKS:

1. S. B. Pope (2010), *Turbulent flows*, Reprinted Edition, Cambridge University Press, USA.
2. Hermann Schlichting (2004), *Boundary Layer Theory*, 8th edition, Springer, Germany.
3. Panton R. L (2005), *Incompressible Flow*, 3rd Edition, John Wiley & Sons, USA.

REFERENCE BOOKS:

1. Biman Chandra Chetia (2010), *Fuzzy Modeling of the Boundary-Layer Theory*, Vdm Verlag, New York
2. White F. M (2007), *Viscous fluid Flow*, 3rd edition, McGraw Hill, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

NANOTECHNOLOGY
(Professional Elective - I)

Course Code: A2341

L	T	P	C
3	1	-	4

Course Overview:

Introduction to Nanotechnology provides a broad overview of nanotechnology, discussing the fundamental science of nanotechnology and its applications to engineering, mechanical, biomedical, and environmental fields.

The course provides a background of the understanding, motivation, implementation, impact, future, and implications of nanotechnology. The course will also discuss specific applications of nanotechnology in electronic devices, biomedical fields, environmental solutions, and energy production. This class is suitable for high school students interested in gaining a fundamental knowledge of nanoscience, in understanding current applications of nanotechnology, and in learning about future prospects in this field. Class presentations and weekly quizzes will allow the students to demonstrate their understanding of the material.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the features of nanomaterials and nanotechnology.
CO2. **Identify** the techniques for nanoparticle fabrication.
CO3. **Categorize** the operations for making the nanocomponents.
CO4. **Evaluat**e the parameters applicable to complex problems in manufacturing process.
CO5. **Compare** the various tools and techniques to optimize the systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

NANOTECHNOLOGY
(Professional Elective - I)

Course Code: A2341

L	T	P	C
3	1	-	4

SYLLABUS

UNIT -I **(10Lectures)**

INTRODUCTION TO NANOTECHNOLOGY: Importance of nano scale, Nanostructure types, electronic, magnetic, optical Properties of Nano materials, top-down and bottom- up approach to nanostructures.

QUANTUM MECHANICAL PHENOMENON IN NANOSTRUCTURES: Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

UNIT -II **(10Lectures)**

CARBON NANO STRUCTURES: Carbon nano tubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

UNIT -III **(10 Lectures)**

FABRICATION OF NANO MATERIALS: Physical Methods: Inert gas condensation, Arc discharge, RF plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

NANO SCALE CHARACTERIZATION TECHNIQUES: Scanning probe techniques (AFM, STM, SEM, TEM), XRD

UNIT-IV **(10 Lectures)**

NANOLITHOGRAPHY AND NANO MANIPULATION: E-beam lithography and SEM based nanolithography and nano manipulation, Ion beam lithography, oxidation and metallization, Mask and its application, Deep UV lithography, X-ray based.

UNIT - V **(10Lectures)**

APPLICATION OF NANOTECHNOLOGY FOR MECHANICAL ENGINEERING: Nano composites: Introduction to polymer nanocomposites, clay nanocomposites, bio & natural nanocomposites, metal matrix nanocomposites (MMNC's). Synthesis of MMNC's. Applications of MMNC's.Nano fluids: an introduction to nanolubricants, nanocutting fluids

TEXT BOOKS:

1. Charles. P. Pode (2010), Introduction to nanotechnology, Reprint Edition, Springer, Germany.
2. Bharat Bhusan (2010), Springer Handbook of Nanotechnology, 3 rd edition, Springer, Germany.
3. Nano materials by J. Dutta & H. Hofman

REFERENCES BOOKS:

1. Phani kumar (2012), Principles of nanotechnology, 3rd edition, Scitech publications, India.
2. Challa S, S. Kumar (2007), Nanofabrication towards biomedical application: Techniques, tools, Application and Impact, 1 st edition, Wiley, VCHUSA.
3. Hari Singh Nalwa (2011), Encyclopedia of Nanotechnology, American Scientific Publishers, USA
4. S. Dutta (2009), Electron Transport in Mesoscopic systems, 8th Print, Cambridge University press, UK.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

MATERIAL SELECTION FOR DESIGNING MECHANICAL SYSTEMS
(Professional Elective - I)

Course Code: A2342

L	T	P	C
3	1	-	4

Course Overview:

This course deals procedures for material selection in mechanical design in order to ensure that the most suitable materials for a given application are identified from the full range of materials and section shapes available.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Basics** of materials, their properties

CO2. **Design** of mechanical system and modelling.

CO3. **Selection** of materials based on performance index and external mechanical factors.

CO4. **Manufacturing** process selection for different materials and cost benefit analysis.

CO5. **Application** of software for over constrained design and failure analysis of materials.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

MATERIAL SELECTION FOR DESIGNING MECHANICAL SYSTEMS
(Professional Elective - I)

Course Code: A2342

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

Introduction: Materials properties – chemical, physical, mechanical, dimensional; Materials categories; Design process, conceptual design, embodiment design, detail design; Ideology of optimization, materials selection charts. Performance indices: Performance, objective function, constraints, performance index; Calculation Model, Measure of Performance, Equations for constrained variables; Design-fixed parameters, free parameters. Optimization of selection without considering shape effects: Recipe for optimization.

UNIT - II

Applying performance indices to selection charts; Primary constraints; Reality Check; Case studies – mirrors for large telescopes, table legs, structural materials for buildings, flywheels, springs, elastic hinges and couplings, pressure vessels, Vibration effects, stiff and high damping materials; Thermal effects, insulations, solar heating, heat exchangers.

UNIT - III

Manufacturing and process selection: Classification of manufacturing processes, review of shaping, joining and finishing processes, Strategy for processes selecting, translation, screening, ranking; Selection charts, process-material matrix, process shape matrix, mass bar-chart, thickness bar-chart, tolerance and surface- roughness bar-charts; Manufacturing cost; Case studies: forming a fan, fabricating a pressure vessel, economical casting.

UNIT - IV

Multiple Constraints in Materials Selection – Over constrained Design: Decision matrices, selection stages, coupling equations, value functions; Multiple Selection Stage Method, Active Constraint Method, Coupling Equation Method; CES Software; Fully determined design; Massively over constrained designs; Conflicting objectives, penalty functions and exchange constants; Case studies – shipbuilding, con-rods for high performance engines, windings for high-field magnets, casing for mini-disk player or cell phone, disk-brake calliper.

UNIT - V

Optimization of selection considering shape effects: Shape factors, Microscopic or micro-structural shape factors; Limits to shape efficiency, stiffness-limited design, strength-limited design, material indices that include shape, elastic bending of beams and twisting of shafts, failure of beams and shafts, co-selection of material and shape; Case studies – choosing optimal I-beam, spars for man-powered planes, ultra-efficient springs, forks for a racing bicycle. Designing hybrid materials: Families of configurations of hybrid materials- composites, sandwiches, lattices and segmented; method “A+B+configuration+scale”; Anisotropy; Case studies – metal matrix composites, refrigerator walls, natural materials.

TEXT BOOKS:

1. M. F. Ashby, Materials Selection In Mechanical Design, Third Edition

REFERENCE BOOKS:

1. J. E. Gordon, The New Science of Strong Materials, or Why You Don't Fall Through the Floor, Princeton University Press, Princeton, NJ.
2. J.E. Gordon, Structures, or Why Things Don’t Fall Down, Da Capo Press.
3. M. F. Ashby and D. R. H Jones, Engineering Materials Parts 1, 2, and 3, Pergamon Press, Oxford, UK.
4. F. A. A. Crane and J. A. Charles, Selection &Use of Engineering Materials, Butter worths, London, UK.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

CAD/CAM LAB

Course Code: A2343

L	T	P	C
-	-	3	2

Course Overview:

Computer Aided Design (CAD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. CAD provides a convenient means to create designs for almost every engineering discipline. Computer-aided manufacturing (CAM) is the use of computer -based software tools that assist engineers and machinists in manufacturing or prototyping product components. Its primary purpose is to create a faster production process and components with more precise dimensions and material consistency, which in some cases, uses only the required amount of raw material (thus minimizing waste), while simultaneously reducing energy consumption. CAM is a programming tool that makes it possible to manufacture physical models using computer-aided design (CAD) programs. CAM creates real life versions of components designed within a software package.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Model** machine components using Computer-Aided Design software.

CO2. **Identify** parametric modeling techniques to reflect engineering requirements.

CO3. **Simulate** the static, dynamic and thermal analysis of the components as per the boundary conditions.

CO4. **Operate** CNC machine to produce machine components.

CO5. **Build** the NC part program as per the geometry of component.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

CAD/CAM LAB

Course Code: A2343

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS

1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting.
2. **PART MODELING:** Generation of various 3D Models through Protrusion, revolve, shell sweep Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators, Design simple components.
3. Manual part programming for CNC machines using standard G and M codes for a CNCLATHE
4. Part programming for Turning, Facing, Chamfering, Grooving, Step turning, Taper turning, Circular interpolation, Combination of few operations on CNClathe
5. Part programming for Point to point motions, Line motions, Circular interpolation, Contour motion, Pocket milling- circular, rectangular, Mirror commands.
6. Part Programming uses Fixed or Canned Cycles for Drilling, Peck drilling, Boring, Tapping, Turning, Facing, Taper turning, Thread cutting.
7. Machining of small components using CNC LATHE & CNC MILLINGMACHINE
8. Exposure to computer assisted part programming – APT or other NC programming language.

Any Four Software Packages from the following for CAD:

CATIA, Pro-E, I-DEAS, UNIGRAPHICS, NISA, AUTOCAD,etc.,

For CAM SOFTWARE: CNC TRAIN, GIBBS CAM, MASTER CAM

Note: (Minimum 12 Experiments to be conducted)

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

THEORY OF MACHINES LAB

Course Code: A2344

L	T	P	C
-	-	3	2

Course Overview:

Theory of Machines lab is to impart practical knowledge on design and analysis of mechanisms for the specified type of motion in a machine. With the study of rigid bodies motions and forces for the transmission systems, machine kinematics and dynamics can be well understood. Demonstration exercises are provided with wide varieties of transmission element models to understand machine kinematics. Various experiments with governors, gyroscopes, balancing machines and universal vibration facilities are available to understand machine dynamics.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Examine** the active and reactive couple based on the principle of angular momentum using gyroscope

CO2. **Apply** the force polygon method for balancing reciprocating and rotating mass systems**.**

CO3. **Calculate** the moment of inertia of various suspension and rotor systems.

CO4. **Analyze** the centrifugal forces in the governors.

CO5. **Determine** the critical speed of the shaft.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R14**

THEORY OF MACHINES LAB

Course Code: A2344

L	T	P	C
-	-	3	2

LIST OF EXPERIMENTS

1. To determine the active and reactive gyroscopic couples and compare them.
2. To determine stiffness of the given helical spring- period and frequency of un damped free vibration (longitudinal vibration) of spring mass system experimentally and compare it with the theoretical values
3. To balance the given reciprocating mass system dynamically with the aid of the force polygon and the couple polygon with respect to primary and secondary forces
4. To balance the given rotor system dynamically with the aid of the force polygon and the couple polygon.
5. To determine the whirling speed for various diameter shafts experimentally and compare it with the theoretical values.
6. To determine the characteristic curves of the proell governor.
7. To determine the characteristic curves of the spring loaded governor
8. To study various types of cams & followers, jump phenomenon and to draw displacement diagram of the follower for the given two cam profiles.
9. To determine the period and frequency of torsional vibration of the single rotor system experimentally and compare it with the theoretical values.
10. To determine the period and frequency of torsional vibration of the two rotor system experimentally and compare it with the theoretical values.
11. To study the transverse vibrations of a simply supported beam subjected to central or offset concentrated load.
12. To determine angular velocity - angular acceleration- mass moment of inertia and centrifugal force of reciprocating masses
13. To determine the natural frequency- radius of gyration and mass moment of inertia of the given rectangular rod experimentally.
14. To determine the radius of gyration and the moment of Inertia of a given circular plate
15. To determine the mass moment of inertia of the given connecting rod by using oscillating method

Note: Minimum 12 Experiments to be conducted

SYLLABI FOR
VIII SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

MECHANICAL VIBRATIONS AND STRUCTURAL DYNAMICS

Course Code: A2346

L	T	P	C
3	1	0	4

Course Overview:

The subject covers the chapters as fundamental vibration, undammed and damped single degree of freedom system, Multi degrees of freedom system, continuous systems, Transient vibrations and Non - linear vibrations, vibration analysis by using numerical methods and aero elastic stability.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Formulate** mathematical models and develop the equations of motion for vibrating systems by different principles

CO2. **Evaluate** vibration systems across a wide range of applications.

CO3. **Explain** the basic concepts of mechanical vibrations and justify their application in a variety of engineering design contexts

CO4. **Analyze** vibrations in structures, machines, vehicles etc.

CO5. **Determine** the impact of various factors on the dynamic behavior of structures

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

MECHANICAL VIBRATIONS AND STRUCTURAL DYNAMICS

Course Code: A2346

L	T	P	C
3	1	0	4

SYLLABUS

UNIT I:

INTRODUCTION- SINGLE DEGREE OF FREEDOM SYSTEMS: Simple harmonic motion, terminology. Degrees of freedom. Free vibrations and forced vibrations- examples of single degree of freedom mechanical vibrations, equation of motion. Spring, inertia, damping elements. Undamped natural frequency, damped natural frequency, damping ratio. Mechanisms of damping. Equivalent viscous damping. Forced vibrations. Examples. Resonance. Vibration measuring instruments. Amplitude and Phase response diagrams. D'Alembert's principle- inertial force.

UNIT II

VIBRATION OF DISCRETE SYSTEMS: Two / Three degree of freedom systems. Static and dynamic coupling. Examples. Principal coordinates, principal modes- orthogonality conditions. Extension to multiple degrees of freedom systems. Vibration absorbers.

VIBRATION OF CONTINUOUS SYSTEMS: Introduction to Hamilton's Principle. Longintudinal, transverse and torsional vibration of cylindrical shafts- extension to tapered shafts. Dynamical equations of equilibria of general elastic bodies.

UNIT III

DETERMINATION OF NATURAL FREQUENCIES AND MODE SHAPES: Natural vibrations of solid continua. Methods of determining natural frequencies and mode shapes.

ROTATING SHAFTS: Natural frequency of rotating shafts. Whirling of shafts. Dynamic balancing of rotating machinery. Dynamic dampers.

UNIT IV

MATRIX METHODS: Matrices for dynamic analysis. Kinematically consistent load systems and determination of [K], [M], [C] and [L] matrices. Normalization and formulation of modal equations.

APPROXIMATE METHODS OF VIBRATION ANALYSIS Introduction to approximate methods for frequency analysis. Rayleigh Ritz method for vibration analysis. Diagonalization of stiffness, mass and damping matrices using orthogonality conditions.

UNIT V

INTRODUCTION TO AEROELASTIC STABILITY: Aeroelastic and inertial coupling. Collar's triangle. Static and dynamic aero elastic phenomena. Aeroelatic instabilities and their prevention. Wing divergence, control reversal and wing flutter, flutter speed. Aero elastic tailoring.

TEXT BOOKS

1. R.W. Clough and Penzien, *Dynamics of Structures.*
2. Rao, Singiresu S. *Mechanical Vibrations*, Pearson EducationLPE-2004.
3. Rao, J.S and Gupta .K., *Theory and practice of Mechanical Vibrations*, Wiley Eastern Ltd., New Delhi,2002.

REFERENCES

1. Megson, T.H.G., *Aircraft Structures for Engineering Students* Butterworth-Heinemann is an imprint of Elsevierl, Oxford OX2 8DP, UK-2007
2. Fung, Y.C., *An Introduction to Theory of Aeroelasticity*, John Wiley & Sons, NewYork,1984 3.fundamental of .*Mechanical Vibrations by ssrao*
3. Harris & Creed, *Shock and Vibrations,* third edition, McGraw-Hill Book Company.
4. Singh, V.P., *Mechanical Vibrations,* Dhanapati Rai and Co. 2003edition.
5. Grahamkelly, S., *Mechanical Vibrations,* TMH 2004edition.
6. Groover, G.K., *Mechanical Vibrations*, Nemchand and Brothers 2001 edition. 8. *Vibrations and Waves MIT series 1987,* CBS Publishers and Distributors

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

FUELS, COMBUSTION AND ENVIRONMENT

(Professional Elective - II)

Course Code: A2347

L	T	P	C
3	1	-	4

Course Overview:

This course will discuss the fundamentals of fuels and combustion technologies, and provide context into the necessity for sustainable development of conventional fuel use, laminar and turbulent flames propagation and structure and environmental considerations.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** various characteristics of the different fuels

CO2. **Evaluate** the thermodynamics and kinetics of combustion

CO3. **Analyze** the combustion mechanisms of various fuels

CO4. **Identify** laminar and turbulent flames propagation and structure.

CO5. **Examine** the air pollution effects on environment and methods of emission control.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

FUELS, COMBUSTION AND ENVIRONMENT
(Professional Elective - II)

Course Code: A2347

L	T	P	C
3	1	-	4

SYLLABUS

UNIT –I:

FUELS: Detailed classification –Conventional and Unconventional Solid, Liquid, gaseous fuels and nuclear fuels –Origin of Coal –Analysis of Coal –Carbonization, Gasification and liquefaction –Lignite: petroleum based fuels –problems associated with very low calorific value gases: Coal Gas –Blast Furnace Gas Alcohols and Biogas.

UNIT –II:

PRINCIPLES OF COMBUSTION: Chemical composition –Flue gas analysis –dew point of products –Combustion stoichiometry. Chemical kinetics –Rate of reaction –Reaction order –Molecularity –Zeroth, first, second and third order reactions -complex reactions –chain reactions. Theories of reaction Kinetics – General oxidation behavior ofHC's.

UNIT –III:

THERMODYNAMICS OF COMBUSTION: Enthalpy of formation –Heating value of fuel-Adiabatic flame Temperature –Equilibrium composition of gaseous mixtures.

UNIT –IV:

LAMINAR AND TURBULENT FLAMES PROPAGATION AND STRUCTURE: Flame stability –Burning velocity of fuels –Measurement of burning velocity –factors affecting the burning velocity. Combustion of fuel, droplets and sprays –Combustion systems –Pulverized fuel furnaces –fixed Entrained and Fluidized Bed Systems.

UNIT–V:

ENVIRONMENTAL CONSIDERATIONS: Air pollution –Effects on Environment, Human Health etc. Principal pollutants –Legislative Measures –Methods of Emission control

TEXT BOOKS:

1. Fuels and Combustion, Chandra Mohan and S.P. Sharma, Tata McGraw Hill, New Delhi, 1984.

REFERENCES:

1. Combustion Fundamentals / Roger A strehlow / Mc GrawHill
2. Combustion Engineering and Fuel Technology / Shaha A.K. / Oxford andIBH.
3. Principles of Combustion / Kanneth K.Kuo/ Wiley andSons.
4. Combustion / Sarkar / Mc. GrawHill.
5. An Introduction to Combustion / Stephen R. Turns/ Mc. Graw Hill InternationalEdition.
6. Combustion Engineering / Gary L. Berman & Kenneth W. Ragland/ Mc. Graw HillInternational

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

COMPOSITE MATERIALS
(Professional Elective - II)

Course Code: A2348

L	T	P	C
3	1	-	4

Course Overview:

The course covers properties of fibre-reinforced polymer composites and the mechanical performance of laminated composites, including failure behavior, design, advanced manufacturing processes, micromechanical modelling, mechanical properties, fracture and fatigue, durability, repair and non-destructive evaluation of composites. The course enables students to obtain knowledge, skills and attitudes needed for the optimum design and manufacture of advanced composite components.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Theoretical aspects** of matrix and fibers of composite materials.

CO2. **Preparation** and properties of Fibers and applications.

CO3. **Manufacturing** process of normal and advanced composites.

CO4. **Design** of composite materials and response to stresses and loads.

CO5. **Composites** used in Aerospace, aeronautical and auto mobile applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

COMPOSITE MATERIALS
(Professional Elective - II)

Course Code: A2348

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Definition, Classification of Composite materials based on structure based on matrix. Advantages of composites, application of composites, functional requirements of reinforcement and matrix.

UNIT - II

FIBERS: Preparation, properties and applications of glass fibers, carbon fibers, Kevlar fibers and metal fibers, properties and applications of whiskers, particle reinforcements.

UNIT - III

MANUFACTURING OF COMPOSITES: Polymer matrix composites: Preparation of Moulding compounds and prepregs, hand layup method, Autoclave method. Filament winding method, Compression moulding, Reaction injection moulding.

UNIT – IV

MANUFACTURING OF ADVANCED COMPOSITES: Metal matrix composite-casting, Solid State diffusion technique, Cladding & Hot isostatic pressing; Ceramic Matrix Composites: Liquid Metal Infiltration, Liquid phase sintering; Carbon – Carbon composites: Knitting, Braiding, Weaving.

UNIT – V

RESPONSE OF COMPOSITES TO STRESS: (a) Iso strain condition (b) Iso stress condition (c) Load friction shared by the fibers.

Use of composites in advanced systems: Aircraft, Automobile, Aerospace and other applications-Retro fitting of composites.

TEXT BOOKS:

1. K. K. Chawla (2010), Composite Materials, 2 nd edition, Springer, USA.
2. V. C. H. Cahn (2007), Material Science and Technology, Vol. 13, 3rd edition, Wiley WCH, West Germany.
3. Autar K. Kaw-Mechanics of composite materials (nd edition)-Tayolr & Francis group.

REFERENCE BOOKS:

1. E. D. Lubin (2003), Hand Book of Composite Materials, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. Muhammad M. Rafique (2009), Composite Materials: Processing and Technology, 2nd edition, Academy Press, Lap Lambert. 3. P. K. Sinha (2006), Composite Materials and structure, IIT Kharagpur,India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

POWER PLANT ENGINEERING
(Professional Elective - II)

Course Code: A2349

L	T	P	C
3	1	-	4

Course Overview:

Systematic approach to describe available sources for producing power, working principle of different power plants and their basic components, functions of each component, importance of each component in different power plants, method to improve the performance. Power Plant Engineering focusing on sources for producing power like conventional sources –fuel as solid, liquid and gaseous, nuclear activity materials, non-conventional sources like solar energy, wind energy, tidal energy, working principle of different power plants like Steam power plant, Diesel power plant, Gas turbine power plant, Hydro-electric power plant, Nuclear power plant, and their basic components, functions of each component, describe power plant economics and environmental considerations.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the classification, working principles of various power plants

CO2. **Differentiate** conventional and non-conventional power plants

CO3. **Describe** various components & auxiliaries, merits and limitations of various power plants

CO4. **Solve** power plant problems by considering economic and environmental aspects

CO5. **Analyze** the performance of various power plants

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

POWER PLANT ENGINEERING
(Professional Elective - II)

Course Code: A2349

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Introduction to the Sources of Energy, Resources and Development of Power in India.

STEAM POWER PLANT: Plant Layout, Working of different Circuits, Types of coals, Properties of coal, Fuel handling equipments, Ash handling systems.

COMBUSTION PROCESS: Overfeed and under feed fuel beds, Traveling grate stokers, Spreader stokers, Retort stokers, Pulverized fuel burning system and its components, Draught system, Cyclone furnace, Dust collectors, Cooling towers and heat rejection, Feed water treatment-Types.

UNIT – II

INTERNAL COMBUSTION ENGINE PLANT: *Diesel Power Plant:* Introduction, IC Engines, Types, Construction, Plant layout with auxiliaries, Fuel supply system, Air starting equipment, Lubrication and cooling system, Super charging.

GAS TURBINE PLANT: Introduction, Classification, Construction -Layout with auxiliaries, Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparision.

UNIT – III

HYDRO ELECTRIC POWER PLANT: Water power, Hydrological cycle/ flow measurement, Drainage area characteristics, Hydrographs, Classification, layout with Plant auxiliaries, Plant operation, Pumped storage plants, Storage and Pondage, Classification of dams and spill ways.

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar, Collectors, Principle of Working, Wind Energy, Types, HAWT, VAWT, Tidal Energy.

UNIT – IV

DIRECT ENERGY CONVERSION: Fuel cells, Thermo electric and Thermo ionic, MHD generation.

NUCLEAR POWER STATION: Nuclear fuel, Breeding and fertile materials, Nuclear reactor, Reactor operation.

TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding - Radioactive waste disposal.

UNIT – V

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, Investment of fixed charges, Operating costs, General arrangement of power distribution, Load curves, Definitions of connected load, Maximum demand, Demand factor, Average load, Load factor, Diversityfactor.

ENVIRONMENTAL CONSIDERATIONS: Effluents from power plants and Impact on environment, Pollutants and pollution standards, Methods of Pollution control.

TEXT BOOKS

1. Rajput (2011), *A Text Book of Power Plant Engineering,* 4th edition, Laxmi Publications, New Delhi, India.
2. Arora and S. Domkundwar (2008), *A Course in Power Plant Engineering*, 5th edition, Dhanpat Rai & Co. Delhi.

REFERENCE BOOKS

1. P. K. Nag (2008), *Power Plant Engineering,* 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi.
2. G.D. Rai (2012, Reprint), *An Introduction to Power Plant Technology*, 3rd edition, Khanna Publications, New Delhi.
3. C. Elanchezhian, L. Saravana Kumar, B. Vijaya Ramkanth (2007), *Power plant Engineering,* 1st edition, I.K International Publishing House, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

AUTOMATION IN MANUFACTURING
(Professional Elective - II)

Course Code: A2350

L	T	P	C
3	1	-	4

Course Overview:

This course will cover types and strategies of automation, automated flow lines, analysis of flow lines, assembly systems and balancing, automatic material handling, adaptive control systems, business process re engineering and techniques of rapid proto typing.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Remember** the types of strategies used in automation

CO2. **Understand** the terminologies used in automation

CO3. **Apply** the suitable material handling and storage system

CO4. Analyze the ways of improving line balance

CO5. **Evaluate** the best adoptive control system suitable to a given process

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

AUTOMATION IN MANUFACTURING

(Professional Elective - II)

Course Code: A2350

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Types and strategies of automation, Automation in machine tools. Mechanical feeding and too changing and machine tool control transfer the automaton.
AUTOMATED FLOW LINES: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

UNIT - II
ANALYSIS OF AUTOMATED FLOW LINES: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT - III
ASSEMBLY SYSTEM AND LINE BALANCING: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

AUTOMATED MATERIAL HANDLING: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems. Automated storage systems, automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT - IV
ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperatures, vibration and acoustic emission.

UNIT - V
BUSINESS PROCESS RE-ENGINEERING: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

TEXT BOOKS:

1. M. P. Groover (2011), Automation, Production Systems and Computer Integrated Manufacturing, 3rdedition,
2. P. N. Rao (2011), CAD/CAM Principles and applications, 3rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Yoram Coreom (2011), Computer control of Manufacturing Systems, 2nd edition, Prentice Hall of India,
2. New W.B uekinsham(2010), Automation,3rd edition,Prentice Hall of India, NewDelhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEVIII Semester **VCE-R14**

ROBOTICS
(Professional Elective - II)

Course Code: A2351

L	T	P	C
3	1	-	4

Course Overview:

This course introduces students to the basics, types and elements of robots. The course exposes students to the theoretical concepts of robot kinematics and dynamics as well as the merger of this for implementation. Programming and path planning concepts gives the perception on control of robotics. The concepts on actuators and sensor gives clear understanding and design ability for mobility systems. It gives an overview on application of robotics in manufacturing industry.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the basic concepts and components of a robotic system.
CO2. **Compute** the forward and inverse kinematics of robots.
CO3. **Utilize** the key concepts of programming and program the robot path with obstacle avoidance.
CO4. **Identify** the use of actuators and sensors for robot mobility system.
CO5. **Interpret** the various applications of robots in Modern Manufacturing Systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

ROBOTICS
(Professional Elective - II)

Course Code: A2351

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics, an over view of Robotics, present and future applications – classification by coordinate system and control system.

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT - II

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation, problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics, problems.

UNIT - III

MANIPULATOR DYNAMICS-I: Differential transformation and manipulators, Jacobians, problems. Dynamics: Lagrange, Euler and Newton, Euler formations, Problems.

MANIPULATOR DYNAMICS-II: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion, straight line motion, Robot programming, languages and software packages.

UNIT - IV

ROBOT ACTUATORS AND FEEDBACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric and stepper motors. Feedback components: position sensors, potentiometers, resolvers, encoders, Velocity sensors.

UNIT - V

ROBOT APPLICATION IN MANUFACTURING: Material Transfer, Material handling, loading and unloading, Processing spot and continuous arc welding & spray painting, Assembly and Inspection.

TEXT BOOKS:

1. M. P. Groover (2010), *Industrial Robotics*, 3rd edition, Pearson Education, New Delhi.
2. K.S. Fu (2010), *Robotics*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.

REFERENCE BOOKS:

1. R.K. Mittal, I. J. Nagrath (2012), *Robotics and Control*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd.,
2. NewDelhi.
3. P. Coiffet, M. Chaironze (2010), *An Introduction to Robot Technology*, 3rd edition, Kogam Page Ltd., London.
4. Richard D. Klafter (2010), *Robotic Engineering*, 2nd edition, Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

NDT TECHNIQUES
(Professional Elective - II)

Course Code: A2352

L	T	P	C
3	1	-	4

Course Overview:

Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. In other words, when the inspection or test is completed the part can still be used.

Today modern nondestructive tests are used in manufacturing, fabrication and in-service inspections to ensure product integrity and reliability, to control manufacturing processes, lower production costs and to maintain a uniform quality level. During construction, NDT is used to ensure the quality of materials and joining processes during the fabrication and erection phases, and in-service NDT inspections are used to ensure that the products in use continue to have the integrity necessary to ensure their usefulness and the safety of the public.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the operation of various NDT equipment used for inspection of metals and non metals.

CO2. **Apply** Scientific and technical knowledge to the field of non destructive testing.

CO3. **Examine** the relevant non destructive testing method for various engineering practice.

CO4. **Plan** for the experiments and validate the report.

CO5. **Test** the product quality and manufacturing defects using emerging techniques.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

NDT TECHNIQUES
(Professional Elective - II)

Course Code: A2352

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

INTRODUCTION: Visual Methods: Optical aids, In-situ metallographic, Optical holographic methods, Dynamic inspection.

UNIT - II

PENETRANT FLAW DETECTION: Principles, Process, Penetrate systems, Liquid penetrate materials, Emulsifiers, cleaners developers, sensitivity, Advantages, Limitations, Applications.

UNIT - III

RADIOGRAPHIC METHODS: Limitations, Principles of radiography, sources of radiation, Ionizing radiation, X-rays sources, Gama-rays sources recording of radiation, Radiographic sensitivity, and Fluoroscopic methods.

ULTRASONIC TESTING OF MATERIALS: Advantages, disadvantages, Applications, Generation of Ultrasonic waves, general characteristics of ultrasonic waves - methods and instruments for ultrasonic materials testing.

UNIT - IV

MAGNETIC METHODS: Advantages, Limitations, Methods of generating fields, magnetic particles and suspending liquids Magnetography, field sensitive probes, applications.

ELECTRICAL METHODS: Eddy current methods: potential-drop methods, applications.

UNIT - V

ELECTROMAGNETIC TESTING: Magnetism, Magnetic domains, Magnetization curves, Magnetic Hysteresis, Hysteresis loop tests, comparator - bridge tests, Absolute single-coil system, applications.

ACOUSTIC & OTHER METHODS: Acoustic Emission methods, Acoustic methods, Leak detection, Thermal inspection.

TEXT BOOKS:

1. Prasad (2011), Non- Destructive Test and Evaluation of Materials, 1st edition, Tata McGraw-Hill, New Delhi.
2. R. Halmshaw (1991), Non-Destructive Testing, 2nd edition, Edward Arnold, America.

REFERENCE BOOKS:

1. Jack Blitz (1997), Electrical and Magnetic Methods of Non-Destructive Testing, Springer, Germany.
2. Jack Blitz (1997), Ultrasonic Methods of Non-Destructive Testing, Springer, Germany.
3. Ravi Prakash (2009), Non-destructive Testing Techniques, 2nd Edition, New Academic Science Ltd., UK.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

TOTAL QUALITYMANAGEMENT
(Professional Elective - III)

Course Code: A2353

L	T	P	C
3	1	-	4

Course Overview:

Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. Basic concepts of quality, quality controlling, consultation, quality assurance, statistical process control, total quality management, statistical quality management, quality systems and service quality.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the concepts of quality, total quality management(TQM) and quality systems.

CO2. **Evaluate** quality using Statistical Tools.

CO3. **Choose** TQM methodologies for continuous improvement of Quality.

CO4. **Utilize** TQM tools for Quality Control**.**

CO5. **Implement** ISO 9000 and other quality systems with documentation and auditing.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

TOTAL QUALITYMANAGEMENT
(Professional Elective - III)

Course Code: A2353

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - 1: INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership - Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT - 2: TQM PRINCIPLES

Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure.

UNIT - 3: STATISTICAL PROCESS CONTROL (SPC)

The seven tools of quality, Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT - 4: TQM TOOLS

Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.

UNIT - 5: QUALITY SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 - Concept, Requirements and Benefits.

TEXT BOOKS

1. Dale H. Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN81-297-0260-6.

REFERENCE BOOKS:

1. James R.Evans & William M. Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth - Hcinemann Ltd., Oxford.1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management - Concepts and Tasks, New Age International1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

TRIBOLOGY
(Professional Elective - III)

Course Code: A2354

L	T	P	C
3	1	-	4

Course Overview:

This course deals Fundamentals of surface contact: surface topography, asperity contact, interfacial phenomena. Friction theories and wear mechanisms. Temperatures in sliding contacts. Hydrodynamic, hydrostatic, elasto-hydrodynamic, air lubricated bearings, boundary lubrication and bearing materials.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** the viscosity and laws of fluid flow with reference to lubrication

CO2. **Illustrate** the behavior of tribological components subjected to different working conditions and describe different tribological measures

CO3. **Analyze** mathematical approach of hydrodynamic and hydrostatic lubrication

CO4. **Describe** the concept of bearings under different load carrying conditions

CO5. **Explain** different bearing materials with their properties and list the advantages and disadvantages

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

TRIBOLOGY
(Professional Elective - III)

Course Code: A2354

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

STUDY OF VARIOUS PARAMETERS: Viscosity- flow of fluids- viscosity and its variation- absolute and kinematic viscosity- temperature variation- viscosity index- determination of viscosity- different viscometers used- lubrication, basic modes of lubrication, lubricants, properties of lubricants -physical and chemical, types of additives, extreme pressure lubricants -Various theories oflubrication.

HYDROSTATIC LUBRICATION: Hydrostatic step bearing- application to pivoted pad thrust bearing and other applications- hydrostatic lifts- hydrostatic squeeze films and its application to journal bearing.

UNIT - II

Friction and Wear Friction: Introduction, laws of friction, kinds of friction, causes of friction, friction measurement, theories of friction, effect of surface preparation. Wear: Types of wear, various factors affecting wear, measurement of wear, wear between solids and liquids, theories of wear.

HYDRODYNAMIC THEORY OF LUBRICATION: Various theories of lubrication- petroffs equation- Reynold's equation in two dimensions- Effects of side leakage- Reynolds equation in three dimensions- Friction in sliding bearing- hydro-dynamic theory applied to journal bearing- minimum oil film thickness- oil whip and whirl anti-friction bearing.

UNIT - III

HYDRODYNAMIC THEORY OF LUBRICATION: Principle of hydrostatic lubrication, General requirements of bearing materials, types of bearing materials., Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, Hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing, optimum design of hydrostatic step bearing

FRICTION AND POWER LOSSES IN JOURNAL BEARINGS: Calibration of friction loss- friction in concentric bearings-bearing modulus- Sommer-field number. Heat balance-practical consideration of journal bearing design considerations.

UNIT – IV

Principle of hydrodynamic lubrication, Various theories of lubrication, petroffs equation, Reynold's equation in two dimensions-Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl, anti -friction bearing, hydrodynamic thrust bearing

AIR LUBRICATED BEARING: Advantages and disadvantages- application to Hydrodynamic journal bearings- hydrodynamic thrust bearings. Hydrostatic thrust bearings- Hydrostatic bearing Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

UNIT - V

TYPES OF BEARING OIL PADS: Hydrostatic bearing wick oiled bearings- oil ring s- pressure feed bearing- partial bearings- externally pressurized bearings.

AIR LUBRICATED BEARING: Advantages and disadvantages- application to Hydrodynamic journal bearings- hydrodynamic thrust bearings. Hydrostatic thrust bearings- Hydrostatic bearing Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

BEARING MATERIALS: General requirements of bearing materials- types of bearing materials.

TEXT BOOKS:

1. Basu- Sen Gupta- Ahuja (2011)-*Fundamentals of Tribology*- 3rd edition- Prentice Hall of India-India.
2. Michael M. Khonsari- E. Richard Booser(2001)-*Applied tribology: Bearing design and Lubrication*- 1st Edition-John wiley and sons- NewYork.
3. Gwidon W. Stachowiak- Andrew W. Batchelor(2005)-*Engineering tribology*-3rd edition-Elsevier butterwoth Heinemann-UK

REFERENCE BOOKS:

1. B. C. Majumdar (2012)-Tribology- 2ndEdition- Prentice Hall of India-India.
2. V. Bandari (2011)- *A Text Book of Design of Machine Elements*- 3rd edition- Tata McGraw hill education (P) ltd- New Delhi-India.
3. Rev D- (2003)- *Air bearing application and design guide*-1 st edition-new way precision-Aston.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

ADVANCED IC ENGINES
(Professional Elective - III)

Course Code: A2355

L	T	P	C
3	1	-	4

Course Overview:

Fundamental Analysis of Operational Characteristics and Design of Diesel and gasoline engines, Fluid flow, Thermodynamic, Combustion and Heat transfer in Engine, Theoretical calculations of Otto cycle for compression, combustion and expansion, Fuel, Friction and Other Parameters affecting Power, Efficiency and Pollutants of IC Engines, Operational Characteristics and design of other kinds of Engines such as Wankel, Stratified Charge, electric hybrid, HCCI Engines and finally Internal Combustion Engines future Potentials and their possible substitutions.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Analyze** different thermodynamic aspects of SI and CI Engines combustion.

CO2. **Explain** gas exchange processes and motion of charge in the cylinder and its effects on combustion process in SI and CI engines

CO3. **Explain** various pollutants formation and their control methods in SI and CI engines

CO4. **Explain** suitability and applications of various alternative fuels to IC Engines.

CO5. **Explain** working principles of Lean burn, Stratified and CRDI Engines.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

ADVANCED IC ENGINES
(Professional Elective - III)

Course Code: A2355

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

SPARK IGNITION ENGINES: Air-fuel ratio requirements, Design of carburetor, fuel jet size and venture size, Stages of combustion-normal and abnormal combustion, Factors affecting knock, Combustion chambers, Introduction to thermodynamic analysis of SI Engine combustion process.

UNIT - II

COMPRESSION IGNITION ENGINES: Stages of combustion-normal and abnormal combustion, Factors affecting knock, Direct and Indirect injection systems, Combustion chambers, Turbo charging, Introduction to Thermodynamic Analysis of CI Engine Combustion process.

UNIT - III

ENGINE EXHAUST EMISSION CONTROL: Formation of NOX, HC/CO mechanism, Smoke and Particulate emissions, Green House Effect Methods of controlling emissions. Three way catalytic converter and Particulate Trap, Emission (HC, CO, NO and NOX) measuring equipments, Smoke and Particulate measurement, Indian Driving Cycles and emission norms.

UNIT - IV

ALTERNATE FUELS FOR IC ENGINES: Alcohols, Vegetable oils and bio-diesel, Bio-gas, Natural Gas, Liquefied Petroleum Gas, Hydrogen, Properties, Suitability, Engine Modifications. CHARATERISTICS OF IC ENGINES: Performanc`e, Combustion and Emission Characteristics of SI and CI Engines using these alternate fuels.

UNIT – V

RECENT TRENDS: Homogeneous Charge Compression Ignition Engine, Lean Burn Engine,Stratified Charge Engine, Surface Ignition Engine , Four Valve and Overhead cam Engines, Electronic Engine Management, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine, Data Acquisition System, pressure pick up, charge amplifier PC for Combustion and Heat release analysis in Engines.

TEXT BOOKS:

1. Heinz Heisler (1998), Advanced Engine Technology, SAE International Publications, USA.
2. Ganesan V. (2007), Internal Combustion Engines, 3rd edition, Tata McGraw-Hill, India.

REFERENCE BOOKS:

1. John B. Heywood (1988), Internal Combustion Engine Fundamentals, Tata McGraw-Hill, New York.
2. Patterson D. J, Henein N. A (1978), Emissions from combustion engines and their control, Ann Arbor Science publishers Inc, USA.
3. Gupta H. N (2006), Fundamentals of Internal Combustion Engines, Prentice Hall of India, India.
4. Ultrich Adler (1995), Automotive Electric / Electronic Systems, Published by Robert Bosh, GmbH

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

FATIGUE AND FRACTURE MECHANICS
(Professional Elective - III)

Course Code: A2356

L	T	P	C
3	1	-	4

Course Overview:

The course covers the basic aspects of Engineering Fracture Mechanics. Spectacular failures that triggered the birth of fracture mechanics, Modes of loading, Classification as LEFM and EPFM, Crack growth and fracture mechanisms, Energy release rate, Resistance, Griffith Theory of fracture, Extension of Griffith Theory by Irwin.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** the concepts of fatigue and fracture mechanics of structure and emphasize the significance of material properties on the behavior of structures

CO2. **Illustrate** the critical issues related to the design of machine component.

CO3. **Analyze** aspects of fatigue behavior based on loading conditions.

CO4. **Design** of mechanical components against failure.

CO5. **Apply** the concepts of fracture mechanics to the behavior of cracks in the structures.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

FATIGUE AND FRACTURE MECHANICS
(Professional Elective - III)

Course Code: A2356

L	T	P	C
3	1	-	4

SYLLABUS

UNIT - I

FATIGUE OF STRUCTURES: S-N Curves, Endurance limit, Effect of mean stress, Notches and stress concentrations, Neuber's stress concentration factors, Plastic stress concentration factor, Notched S-N curves.

DESIGN OF COMPONENTS: Goodman, Gerber and Soderberg relations and diagrams, Modified Goodman Diagram, Design of components subjected to axial, bending, torsion loads and combination of them.

UNIT - II

STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR: Low cycle and high cycle fatigue, Coffin Manson's relation, Transition life, cyclic strain hardening and softening.

LOAD ASPECTS: Analysis of load histories, Cycle counting techniques, Cumulative damage, Miner's theory, other theories.

UNIT - III

PHYSICAL ASPECTS OF FATIGUE: Phase in fatigue life, Crack initiation, Crack growth, Final fracture, Dislocations, Fatigue fracture surfaces.

FRACTURE MECHANICS PRINCIPLES: Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical hole, Strength ideal materials, Griffith's energy balance approach. Irwin-Orwin extension of Griffith's theory to ductile materials. Fracture mechanics approach to design. NDT and Various NDT methods used in fracture mechanics, Numerical problems.

UNIT - IV

Fracture Mechanisms in Metals: Ductile Fracture, Clevage, The ductle-Brittle Transition, Intergranular Fracture

Fracture Mechanisms in Nonmetals: Engineering Plastics, Ceramics and composite materials

UNIT - V

PRACTICAL PROBLEMS: Introduction, through cracks emanating from holes, corner cracks at holes, cracks approaching holes, combined loading, Fatigue crack growth under mixed loading, Biaxial loading.

TEXT BOOKS:

1. DAVID BROEK (1982), Elementary engineering fracture mechanics, Martinus Nihoff Publishers.
2. T.L. Anderson, FRACTURE MECHANICS: Fundamentals and applications, CRC Press Taylor & Francis Group.
3. J. F. Knott (1983), *Fundamentals of Fracture Mechanics*, Butter Worth & Co., Publishers Ltd., London.
4. C. G. Sih (1989) *Mechanics of Fracture*, Vol. I, Sijthoff and Noordhoff International Publishing Co., Netherlands.

REFERENCE BOOKS:

1. W. Barrois, E. L. Ripley (1983), *Fatigue of Aircraft Structures*, Pergamum Pres., Oxford, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEVI/VII/VIII Semester **VCE-R14**

WELDING TECHNOLOGY
(Professional Elective - III)

Course Code: A2357

L	T	P	C
3	1	-	4

Course Overview:

The welding technology program prepares students for employment in a variety of welding-related occupations in the manufacturing, industrial, or utility industries. The program teaches students basic to intermediate skills of major welding processes, Shielded Metal Arc (SMAW), Flux-Cored Arc (FCAW), Gas Metal Arc (GMAW), Gas Tungsten Arc (GTAW) and Resistance Welding Processes. This course also includes type of weld defects and tests.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Explain** different types of welding processes and the principles guiding the operations.
CO2. **Analyze** the causes of welding defects and their prevention.
CO3. **Select** welding parameters to obtain desired mechanical properties of welded joints.
CO4. **Describe** arc welding and resistance welding processes.
CO5. **Identify** the welding equipment needed for different applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

WELDING TECHNOLOGY
(Professional Elective - III)

Course Code: A2357

L	T	P	C
3	1	-	4

UNIT - I

PROCESSES AND TYPES OF JOINTS: Classification of fusion welding processes, heat source intensity, heat input rates, shielding methods. Metallurgical effect of weld thermal cycle, residual stresses, formation and relieving. Types of weld joints, Edge preparation, cleaning of edges, tack welding.

UNIT - II

ARC WELDING AND JOINING METHODS: Electrodes, types of covering, welding techniques for manual welding, power Sources, arc cutting, Carbon arc, submerged arc welding, gas tungsten arc (GTA) and gas metal arc (GMA) welding, electric slag welding, carbon dioxide (CO2) welding and plasma arc welding**.** Heat affected Zone and its significance in welding. Metallurgical aspects of welding pre and post heat treatment. Pre heating, vibratory stress relieving. Soldering, brazing, welding, conventional welding processes, Gas, Arc, TIG, MIG, Termite, resistance, Friction, Electro slag etc. Special welding processes: LASER, Electron Beam, Submerged Arc welding etc.

UNIT -III

THERMAL CUTTING OF METAL: Oxygen cutting, flame cut ability of metals, effect of cutting on structure and properties of steel, oxygen lancing machine cutting. Welding of different types of materials, like carbon and alloy steels, cast iron non-ferrous metals and alloys, aluminum. Soldering and Brazing: Capillary and welding action, temperature range, filler metals and fluxes, processes and application, design and strength of joints.

UNIT -IV

RESISTANCE WELDING: Spot welding, electrode, nugget size, resistance and force, current and time, types of equipment, rocker arm press type, multiple welding guns and portable welders, applications, seam welding, projection welding, flash and butt welding, applications. Gas Welding: Gas welding, fuel gases, flames, torches, filler metal, fluxes, backward and forward welding ,filler rod diameter, atomic hydrogen welding, termite welding.

UNIT - V

SOLID PHASE WELDING: Cold pressure welding, weld formation, techniques for lap and butt welding, applications; diffusion joining; process variables, applications, forge welding, ultra sonic welding. Radiation Welding: Laser welding, electron beam welding types of electron gun, spot size beam power, operating voltage, pulse technique, deep penetration and applications. Welding defects and remedies. Estimation of welding cost, Application of welding for aluminum & stainless steel.

TEXT BOOKS:

1. Nadkarni. S. V, “Modern Arc Welding Technology”, Ador Welding Ltd. Oxford and IBH Publishing, 2005.

REFERENCE BOOKS:

1. William A. Bowditch, Kevin E. Bowditch, Mark A. Bowditch, “Welding Technology Fundamentals”, Goodheart-Willcox Publisher, 2009.
2. Parmar. R. S, “Welding Engineering And Technology”, Khanna Publishers,2004.
3. Richard L. Little, “Welding and welding Technology”, TATA McGraw Hill Publishing Company Ltd, 1973(2008)Rao
4. Lacaster. J. F, “The Metallurgy of Welding, Soldering and Brazing”, George Alien and Unwin Ltd., London.
5. “Welding Handbooks” – American Welding Society.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

SOLAR ENERGY
(Professional Elective - III)

Course Code: A2358

L	T	P	C
3	1	-	4

Course Overview:

This course deals the solar radiation, standard radiation scale, solar radiation measurement and estimation, solar collectors, solar energy applications and storage of solar energy.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Describe** the environmental aspects of non-conventional energy resources.

CO2. **Measure** and evaluate different solar energy technologies through knowledge of the physical function of the devices.

CO3. **Communicate** technological and socio-economic issues around solar energy in a concise and an accessible way to a target group with basic technical skills.

CO4. **Acquire** the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications.

CO5. **Compare** Solar, Wind and bio energy systems, their prospects, Advantages and limitations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

SOLAR ENERGY
(Professional Elective - III)

Course Code: A2358

L	T	P	C
3	1	-	4

SYLLABUS

UNIT I

SOLAR RADIATION

History of solar energy utilization - Solar radiation and modeling - Empirical equations for predicting the availability of solar radiation – Measurement of global, direct and diffuse radiation – Radiation computations on inclined surfaces – Angstrom's turbidity - Solar chart - Standard radiation scale.

UNIT II

SOLAR RADIATION MEASUREMENT AND ESTIMATION

Measurement of solar radiation - Solar energy measuring instruments – Pyranometer – Pyrheliometer– Sunshine recorder - Estimation of average solar radiation - Ratio of beam and total radiation on tilted surface of that on horizontal surface.

UNIT III

SOLAR COLLECTORS

Flat plate collector - Materials for flat plate collector and their properties - Thermal Analysis of Flat plate Collector and Useful Heat Gained by the fluid - fin efficiency - collector efficiency factor – Heat Removal Factor - Focusing collectors - Types and applications of focusing collectors

UNIT IV

SOLAR ENERGY APPLICATIONS

Introduction and principle of operation of solar cooker - solar air heater - solar water heater – solar distillation - solar pond - solar thermal power generation – Greenhouse - Solar PV system.

UNIT V

STORAGE OF SOLAR ENERGY

Types of Energy Storage - Thermal Storage - Electrical Storage - Chemical Storage - hydro-storage

TEXTBOOKS:

1. D.YogiGoswami,FrankKreith,Jan.F.Kreider,"PrinciplesofSolarEngineering",2nd Edition,1983
2. Edward E. Anderson, "Fundamentals for solar energy conversion", Addison Wesley Publ. Co., Taylor & Francis, 2000, Indian reprint,2003

REFERENCES:

1. Rai, G.D., Solar Energy Utilization, Khanna Publishers, N. Delhi,2010.
2. Sukhatme S.P., Solar Energy, Tata McGraw Hills P Co., 3rd Edition,2008.
3. Jean Smith Jensen, Applied solar energy research: a directory of world activities and bibliography of significant literature, Volume2, Association for Applied Solar Energy, Stanford Research Institute,2009.

4. Duffie, J.A., and Beckman, W.A. Solar Energy Thermal Process, John Wiley and Sons, New 7. York,2006.
8. Jui Sheng Hsieh, Solar Energy Engineering, Prentice- Hall, 2007.
9. Garg, H.P.,Treatise on Solar Energy, John Willey & Sons,2006.
10. Anna Mani, S Rangarajan: Handbook of Solar Radiation Data for India, AlliedPublishers, 2006.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

SIMULATION LAB

Course Code: A2359

L	T	P	C
-	-	6	2

Course Overview:

The course will introduce the basic concepts of computation through modeling and simulation that are increasingly being used by engineers. The laboratory exercises are designed to give students ability to design and analyze the engineering problems. Students will use ANSYS to simulate and analyze the real time problems.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Understand** the basic concepts of analysis software

CO2. **Simulate** the static, dynamic and thermal analysis of the components as per the boundary conditions.

CO3. **Analyze** simulation results and effective documentation.

CO4. **Acquire** expertise in usage of modern tools.

CO5. **Utilize** the tools like ANSYS in solving the real time problems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R14**

SIMULATION LAB

Course Code: A2359

L	T	P	C
-	-	6	2

SYLLABUS

LIST OF EXPERIMENTS:

1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket
3. Stress analysis of an axi-symmetric component
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2Dcomponent
8. Thermal stress analysis of a 2Dcomponent
9. Conductive heat transfer analysis of a 2Dcomponent
10. Convective heat transfer analysis of a 2Dcomponent
11. Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C /MAT Lab.
12. Simulation of Hydraulic / Pneumatic cylinder using C / MAT Lab.
13. Simulation of cam and follower mechanism using C / MAT Lab.

Any two software packages can be used in the following:

ANSYS, OCTAVE, ELMER, MATLAB, C Language

Note: Minimum 12 Experiments to be conducted.

Frequently asked Questions and Answers about autonomy

1. **Who grants Autonomy? UGC, Govt., AICTE or University**
   In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the UGC that finally grants autonomy.

2. **Shall VCE award its own Degrees?**
   No. Degree will be awarded by Jawaharlal Nehru Technological University Hyderabad with a mention of the name Vardhaman College of Engineering on the Degree Certificate.

3. **What is the difference between a Deemed to be University and an Autonomy College?**
   A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. **How will the Foreign Universities or other stake–holders know that we are an Autonomous College?**
   Autonomous status, once declared, shall be accepted by all the stake holders. Foreign Universities and Indian Industries will know our status through our college website.

5. **What is the change of Status for Students and Teachers if we become Autonomous?**
   An autonomous college carries a prestigious image. Autonomy is actually earned out of continued past efforts on academic performance, capability of self-governance and the kind of quality education we offer.

6. **Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?**
   There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee is a Non–Statutory body, which will keep an eye on the academics and keep its reports and recommendations every year. In addition to the Academic Council, the highest academic body also supervises the academic matters. At the end of three years, there is an external inspection by the University for this purpose. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration, and such other parameters are involved in this process.

7. **Will the students of VCE as an Autonomous College qualify for University Medals and Prizes for academic excellence?**
   No. VCE has instituted its own awards, medals, etc. for the academic performance of the students. However, for all other events like sports, cultural and co-curricular organized by the University the students shall qualify.

8. **Can VCE have its own Convocation?**
   No, since the University awards the Degree the Convocation will be that of the University.

9. **Can VCE give a provisional Degree certificate?**
   Since the examinations are conducted by VCE and the results are also declared by VCE, the college sends a list of successful students with their final grades of marks to the University.

Therefore, with the prior permission of the University the college will be entitled to give the Provisional Certificate.

10. Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment, besides the autonomous status is more responsive to the needs of the industry. As a result, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 25 % for internal assessment and 75 % for external assessment. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. Will there be any Revaluation or Re-Examination System?

Students shall be permitted for re-evaluation after the declaration of end semester examination results within a stipulated period by paying prescribed fee. But there will not be any re-examination system.

13. How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

14. Will the Degree be awarded on the basis of only final year performance?

No. The grades will reflect the average performance of all the semesters put together in CGPA format.

15. Who takes Decisions on Academic matters?

The Academic Council of College is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like the BOS which are like Boards of Studies of the University.

16. What is the role of Examination committee?

The Exam Committee is responsible for the smooth conduct of internal and external examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Grade Sheet etc fall within the duties of the Examination Committee.

17. Is there any mechanism for Grievance Redressal?

Yes, the college has grievance redressal committee, headed by a senior faculty member of the college.

18. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulations.

19. Who declares the result?

The result declaration process is also defined. After tabulation work, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the College Academic Council for its approval. The result is then declared on the college notice boards and posted on the web site of the college. It is eventually sent to the University.

20. What is our relationship with the Jawaharlal Nehru Technological University Hyderabad?

We remain an affiliated college of the Jawaharlal Nehru Technological University Hyderabad. The University has the right to nominate its members on the academic bodies of the college.

21. Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

22. Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our UG and PG programmes are also enjoying autonomous status.

23. How many exams will be there as an autonomous college?

This is defined in the Rules & Regulations.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

Undertaking by Students/Parents

"To make the students **attend** the classes regularly from the first day of starting of classes and be aware of the **College regulations**, the following Undertaking Form is introduced which should be signed by both **student and parent**. The same should be submitted to the College Administrative Office."

I, Mr. / Ms. ---------- joining I Semester / III Semester for the academic year 2015-2016/ 2016-2017 in Vardhaman College of Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the **ACKNOWLEDGEMENT** duly signed by me and my parent and submit it to the Admin Office.

1. I will **attend** all the classes from the **joining day** of the College as per the timetable. In case, I do not turn up even after two weeks of starting of classes, I shall be **in eligible** to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure overall attendance of **not less than 75%** as stipulated by College/JNTUH. I am fully aware that an overall attendance of less **than 65% will make me lose one year.**
3. I will compulsorily follow the **dress code** prescribed by the college.
4. I will conduct myself in a highly **disciplined** and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the College.
5. I will concentrate on my **studies** without wasting time in the Campus/Hostel/Residence and attend all the **tests** to secure more than the minimum prescribed Class/Sessional Marks in each subject. I will submit the **assignments** given in time to improve my performance.
6. I will not bring **Mobile Phone** to the College campus and also, I will not involve in any form of **ragging** inside or outside the campus. I am fully aware that bringing mobile phone to the campus is not permissible and involving in Ragging is an **offence** and punishable as per JNTUH/UGC rules and the law.
7. I will **pay** tuition fees, examination fees and any other **dues** within the stipulated time as required by the Institution/ authorities, failing which I will not be permitted to attend the classes.
8. I will **not cause or involve** in any sort of **violence or disturbance** both within and outside the college campus.
9. If I **absent myself continuously for 3 days**, my **parents** will have to meet the HOD concerned/ Principal.
10. I hereby **acknowledge** that I have **received** a copy of **R15 Academic Rules and Regulations, Syllabus copy** and hence, I shall **abide** by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per College/JNTUH rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student

Signature of Parent
Name & Address with Phone Number

-- STUDENT COPY --

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

Undertaking by Students/Parents

"To make the students **attend** the classes regularly from the first day of starting of classes and be aware of the **College regulations**, the following Undertaking Form is introduced which should be signed by both **student and parent**. The same should be submitted to the College Administrative Office."

I, Mr. / Ms. ---------- joining I Semester / III Semester for the academic year 2015-2016/ 2016-2017 in Vardhaman College of Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the **ACKNOWLEDGEMENT** duly signed by me and my parent and submit it to the Admin Office.

1. I will **attend** all the classes from the **joining day** of the College as per the timetable. In case, I do not turn up even after two weeks of starting of classes, I shall be **ineligible** to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure overall attendance of **not less than 75%** as stipulated by College/JNTUH. I am fully aware that an overall attendance of less **than 65% will make me lose one year.**
3. I will compulsorily follow the **dress code** prescribed by the college.
4. I will conduct myself in a highly **disciplined** and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the College.
5. I will concentrate on my **studies** without wasting time in the Campus/Hostel/Residence and attend all the **tests** to secure more than the minimum prescribed Class/Sessional Marks in each subject. I will submit the **assignments** given in time to improve my performance.
6. I will not bring **Mobile Phone** to the College campus and also, I will not involve in any form of **ragging** inside or outside the campus. I am fully aware that bringing mobile phone to the campus is not permissible and involving in Ragging is an **offence** and punishable as per JNTUH/UGC rules and the law.
7. I will **pay** tuition fees, examination fees and any other **dues** within the stipulated time as required by the Institution/ authorities, failing which I will not be permitted to attend the classes.
8. I will **not cause or involve** in any sort of **violence or disturbance** both within and outside the college campus.
9. If I **absent myself continuously for 3 days**, my **parents** will have to meet the HOD concerned/ Principal.
10. I hereby **acknowledge** that I have **received** a copy of **R15 Academic Rules and Regulations, Syllabus copy** and hence, I shall **abide** by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per College/JNTUH rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student

Signature of Parent
Name & Address with Phone Number

-- OFFICE COPY --